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EVALUATION OF THE IMPACT OF METEOROLOGICAL RESTRICTIONS ON THE TEAD CHEMICAL STOCKPILE DISPOSAL PROGRAM

VOLUME I

8 SEPTEMBER 1989

APPROVED FOR PUBLIC RELEASE / DISTRIBUTION UNLIMITED

OFFICE OF THE PROGRAM MANAGER FOR CHEMICAL DEMILITARIZATION
ABERDEEN PROVING GROUND, MARYLAND 21010-5401

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This document has been prepared in support of the Tooele Army Depot (TEAD) Site Specific Environmental Impact Statement (SSEIS) for the Chemical Stockpile Disposal Program (CSDP). This study evaluates the impact of TEAD site specific meteorological, geographical and chronological effects on the hazard distances resulting from the Credible Catastrophic Accidents (CCAs) used in the Final Programmatic Environmental Impact Statement (FPEIS). In addition, the study evaluates the impact on the total risk to the public by restricting or partially restricting disposal operations to the portion of the day when stable meteorological conditions do not exist.

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VOLUME I

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8 September 1989

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1.0 Summary.

a. The purpose of this study was to examine the Tooele Army Depot (TEAD) site specific meteorological, chronological and geographical effects on the hazard distances associated with the internally initiated (process dependent) disposal Credible Catastrophic Accident (CCA) scenarios used in the Chemical Stockpile Disposal Program (CSDP) Final Environmental Impact Statement (FPEIS). In addition, the study evaluated three disposal options to determine the impact on the total risk to the public by restricting or partially restricting disposal operations to the portion of the day when stable meteorological conditions do not exist.

b. Of the 26 FPEIS internally initiated disposal CCA scenarios, only 11 continue to meet the definition of a CCA after the TEAD site specific conditions are taken into account (i.e. 10^{-8} probability or greater of creating a downwind hazard distance which exceeded the installation boundary). The 11 CCA scenarios only exist under stable meteorological conditions therefore it is possible to eliminate the CCA scenarios by restricting disposal operations to the portions of the day when stable meteorological conditions do not exist (two hours after sunrise to on one hour before sunset). However simply restricting disposal facility operations to non-stable meteorological conditions will not prevent off-post excursions because three non-CCA scenarios create off-post excursions under neutral stability which can exist 24-hours per day. To preclude off-post excursions from these scenarios additional restrictions involving wind speed and/or solar radiation would be required.

c. The total risk from disposal of the TEAD stockpile (including depot storage, handling and transportation as well as disposal facility operations) is **very small** with expected lethalities on the order of 10^{-4} (0.0001). Although the total risk from unrestricted disposal operations presented the least risk to the public, the differences between the three options were within the accuracy of the calculations. The predominate risk for all the disposal options is the risk for depot storage which ranges for 65 to 76 percent of the total risk. The risk from internally initiated disposal accidents only represents a maximum of one-percent of the total risk to the public.

d. Based on the results of this study, it is recommended that the TEAD CSDP disposal facility operations not be restricted on the basis of stable meteorological conditions. To help reduce the total risk to the public it is recommended that the munition disposal sequence be optimized to accelerate the disposal of the munitions which present the greatest storage risk. In addition, the feasibility of further restricting handling and transportation activities to the portions of the day when stable meteorological conditions do not exist should be evaluated. However, restricting handling and transportation activities should only be performed if the restrictions do not impede disposal operations.

2.0 Introduction.

2.1 Purpose. To quantitatively assess and compare the risks associated with operating the proposed Tooele Army Depot (TEAD) Chemical Stockpile Disposal Program (CSDP) disposal facility on a restricted versus an unrestricted operating schedule. The study will examine the TEAD site-specific meteorological, chronological and geographical effects on the hazard distances associated with the internally initiated disposal process Credible Catastrophic Accidents used in the CSDP Final Programmatic Environmental Impact Statement (FPEIS). Different operating scenarios will then be evaluated to determine which operating scenario represents the lowest programmatic risk to the public.

2.2 Background.

a. The United States has repeatedly renounced the first use of chemical weapons. However, as a deterrent to first use by other nations, the United States currently maintains a retaliatory stockpile of lethal unitary, or single component, chemical munitions. The stockpile is comprised of projectiles, cartridges, mines, rockets and bulk containers and munitions such as bombs and spray tanks, which are filled with nerve agents Sarin (GB) or VX, or blister agent Mustard (H/HD/HT). Fact sheets on the munitions and chemical agents comprising the United States stockpile of chemical munitions are contained in Appendix B. All of the chemical agents in the stockpile are at least 21 years old, with some over 40 years old. No unitary chemical agents or munitions have been manufactured since 1968.

b. Approximately 93% of the chemical stockpile is stored at the eight locations within the United States shown in Figure 2-1, the remainder is stored on Johnston Island, which is located in the Pacific Ocean approximately 717 nautical miles southwest of Hawaii, and in the Federal Republic of Germany. The chemical stockpile at TEAD comprises approximately 42% of the United States chemical stockpile on a agent tonnage basis, making it the largest chemical stockpile in the Western Hemisphere. Although the types of agents and munitions stored at TEAD is not classified, the quantity of munitions and agents is classified for reasons of national security.

c. Because of the increasing obsolescence of the chemical stockpile and the increasing risk which the unitary chemical agents pose to the public, the United States Congress passed Public Law 99-145, also known as the Defense Authorization Act for FY 1986(1), which directed the Secretary of Defense to destroy the lethal unitary chemical stockpile by 30 September 1994 in conjunction with the acquisition of the safer binary, or two component, chemical weapons systems. In September 1988, Congress passed Public Law 100-456(2), which extended the completion deadline to 30 April 1997.

d. The Office of the Program Manager for Chemical Demilitarization (Ofc PM Cml Demil) has been assigned the mission of disposing of the lethal unitary chemical stockpile and for ensuring that the Chemical Stockpile Disposal Program (CSDP) is conducted in such a manner as to provide maximum protection of the environment, the general public, and the personnel involved in the destruction.

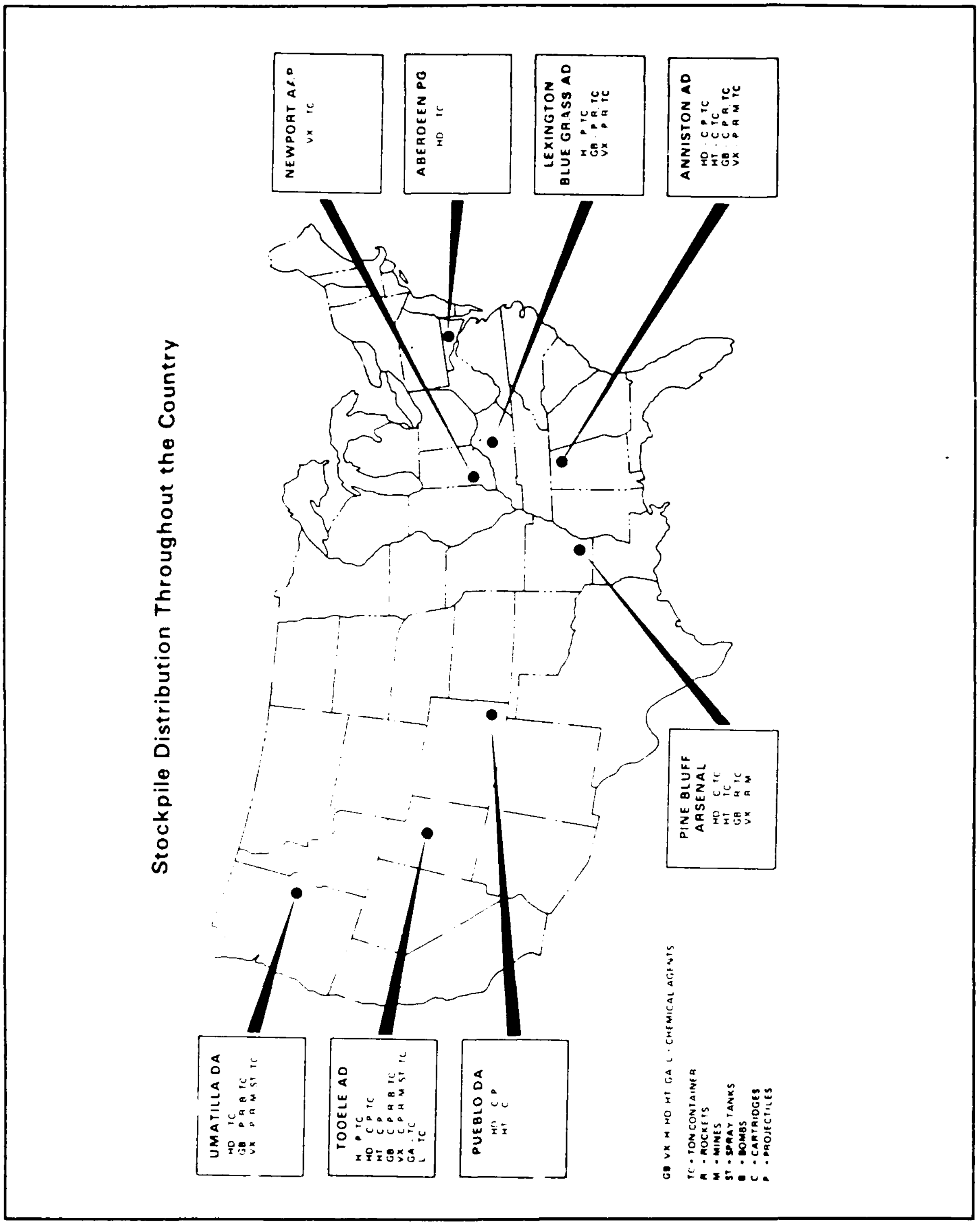

Figure 2-1: Chemical Stockpile Locations Within the United States

2.3 Final Programmatic Environmental Impact Statement

a. In accordance with the National Environmental Policy Act (NEPA), the Ofc PM Cml Demil (formally known as the Office of the Program Executive Officer-Program Manager for Chemical Demilitarization) prepared a programmatic environmental impact statement to assess the health and environmental impacts of destroying the chemical stockpile. The Final Programmatic Environmental Impact Statement was published in January 1988 with the conclusion that onsite disposal of the chemical agents and munitions was the environmentally preferred alternative[3].

b. In Section 4 of the FPEIS, the health and environmental impacts of the disposal alternatives considered were evaluated. As the impacts of normal disposal operations for each alternative were very limited in scope and significance, the primary discriminator between the alternatives were the impacts associated with unintentional releases of chemical agent. The evaluation was based on Credible Catastrophic Accidents which were defined as accidents with a programmatic probability of 10^{-8} (0.00000001) or greater. The selection of 10^{-8} reflected that our society generally spends resources on mitigating accidents with a probabilities of 10^{-5} to 10^{-6}; the 10^{-8} reflected two orders of magnitude of uncertainty to achieve a conservative position on what accidents were of concern. Credible Catastrophic Accidents were defined by the amount of agent released under weather conditions that would result in the maximum downwind dispersion of agent. Stated another way, Credible

Catastrophic Accidents were events which had a programmatic probability of 10^{-8} or greater of creating a downwind hazard distance which exceeded the installation boundary. Therefore the probability of a Credible Catastrophic Accident is a function of the probability of a accident releasing the agent and the annual frequency of the meteorological conditions dispersing the agent.

c. In support of the FPEIS, a series of comprehensive risk assessments were performed to identify catastrophic accidents associated with each disposal alternative. The assessments were performed in two parts:

(1) The first phase of the risk assessment was a probabilistic assessment of the frequency and magnitude of potential chemical agent releases associated with the disposal alternatives[(4)]. After initiating events had been identified and the corresponding logic models (sequence of events) had been developed, the events were screened to ensure the median unit frequency (event per year, mile or munition/pallet depending on the accident scenario) of the each event was greater than or equal to 10^{-10} and the amount of agent released created a lethal dose at a distance of 500 meters (The selection of 500 meters was based on Newport Army Ammunition Plant which has the shortest disposal facility-to-installation boundary distance of any of the chemical agent storage sites.) If the event did not meet the above criteria, it was dropped from consideration due to its low credibility or its inability to impact public safety.

(2) The second phase of the risk assessment quantified each accident scenario in terms of programmatic accident probability, hazard distances and potential lethalities[5].

(a) The accident probabilities were determined by converting the median unit frequencies estimated in the first phase of the risk assessment to mean unit frequencies. The mean unit frequencies were then converted to programmatic probabilities by multiplying the unit frequencies by the appropriate number of years, miles or munitions/pallets for each installation stockpile. If the programmatic probability was less than 10^{-8} the accident was dropped from consideration for use in the FPEIS.

(b) Figure 2-2 is the TEAD disposal schedule which was used for the FPEIS risk assessment; the actual time required to dispose of a specific munition is classified since the munition stockpile could be determined give the published disposal rates. After the publication of the FPEIS, it was determined that it was more efficient and cost effective to increase the capacity of the TEAD CSDP disposal facility by adding a second liquid incinerator rather than constructing the Chemical Agent Munitions Disposal System (CAMDS) Bulk Facility.

(c) The Army's D2PC atmospheric dispersion model[6] was used to estimate hazard distances resulting from each of the accident scenarios which met the criteria described in paragraph 2.3.c.(1) above. Two programmatic

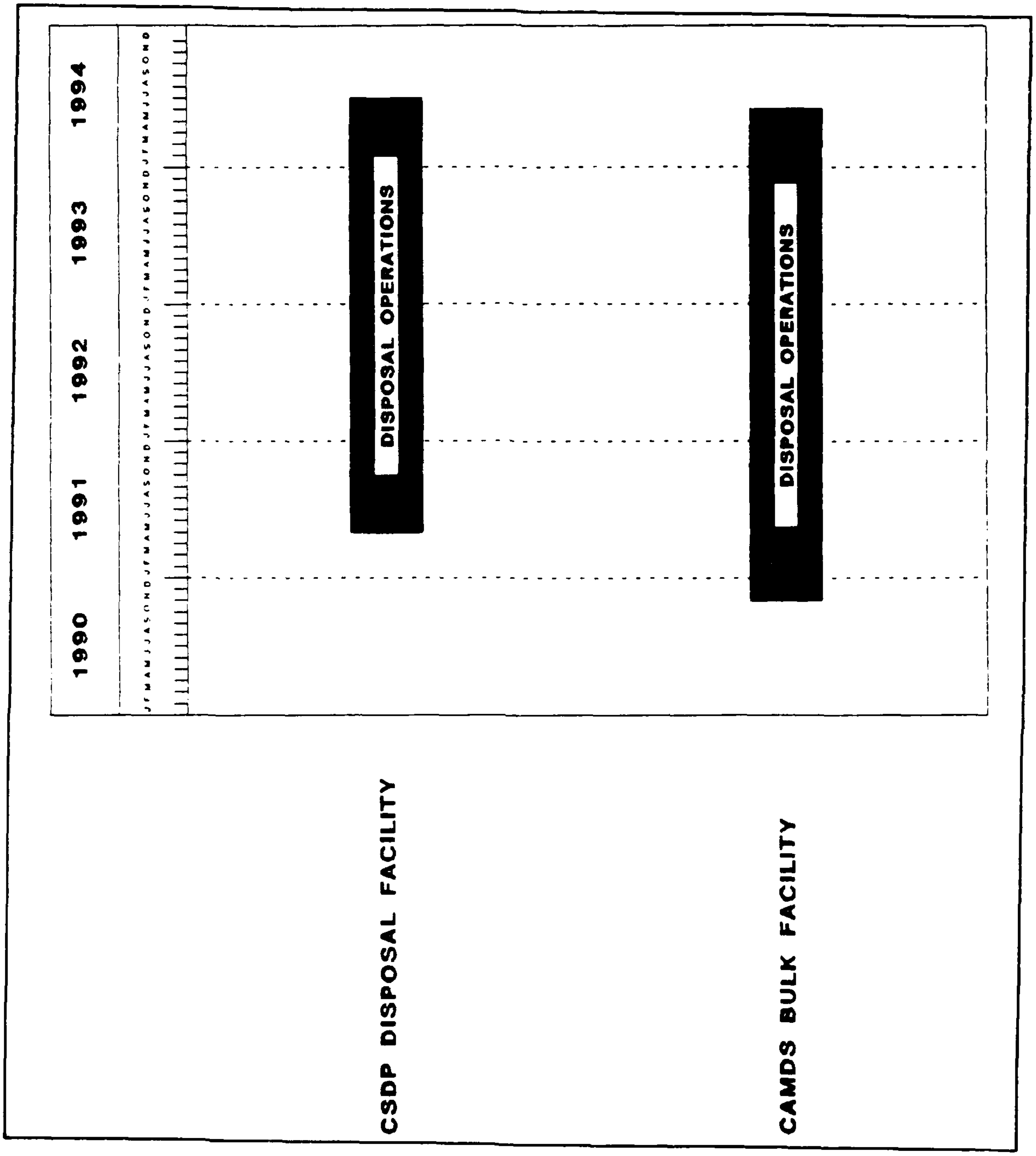

Figure 2-2: FPEIS Baseline Schedule for the TEAD Onsite Disposal Schedule

meteorological conditions were used to estimate the associated hazard distances for each of the selected accident scenarios: Conservative Most Likely (CML) and Worst Case (WC). The CML scenario represented a frequently occurring meteorological condition that resulted in relatively large hazard distances compared to other frequently occurring meteorological conditions. The WC scenario represented a credible condition that resulted in near maximum hazard distances. The meteorological conditions assigned to CML and WC are listed in Table 2-1.

Table 2-1: Meteorological Parameters Used in FPEIS Dispersion Modeling

Parameter	Meteorological Condition	
	CML	WC
Atmospheric Pressure, mm Hg	760	760
Height of Mixing Layer, meters	750	750
Wind Speed, meters/sec	3	1
Temperature, Deg Centigrade	20	30
Pasquill Stability Category	D	E
Frost Profile	0.25	0.25
Roughness Length, cm	1	1

(d) Since frequency values could not be assigned to the programmatic meteorological conditions used in the dispersion calculations, the probabilities used to define the FPEIS Credible Catastrophic Accidents were a function only of the accident frequencies described in paragraph 2.3.b.. The result of the FPEIS risk assessment for TEAD are contained in Appendix C (Appendix II).

2.4. Concern with Multiple Shift Operations. A growing concern has arisen from the Department of Health and Human Services (DHHS) and the State of Utah about the advisability of operating the CSDP disposal facility on a 24-hours a day basis. This concern is based on the observation that worst-case meteorological conditions - - which lead to the largest potential for human fatalities in the event an accidental chemical agent release - - occur most frequently at night. The proposed solution is to limit disposal operations to meteorological conditions which will keep lethal concentrations of chemical agent resulting from a Credible Catastrophic Accident within the installation boundaries. However, the potential decrease in disposal risk may be offset by the higher risks associated with increased chemical agent and munition storage time and the potentially higher risks associated with daily start-up and shutdown of the incinerators and processes. It is this problem which this study addresses.

REFERENCES

1. Department of Defense Authorization Act, 1986, Public Law 99-145, 29 November 1985.

2. Department of Defense Authorization Act, 1988, Public Law 100-456, September 1988.

3. Chemical Stockpile Disposal Program Final Programmatic Environmental Impact Statement, Volumes 1-3, January 1988, Program Executive Officer-Program Manager for Chemical Demilitarization.

4. Chemical Stockpile Disposal Program; Risk Analysis of the Onsite Disposal of Chemical Munitions, August 1987, SAPEO-CDE-IS-87010, Program Executive Officer-Program Manager for Chemical Demilitarization.

5. Risk Analysis in Support of the Chemical Stockpile Disposal Program, December 1987, SAPEO-CDE-IS-87014, Program Executive Officer-Program Manager for Chemical Demilitarization.

6. Personnel Computer Program for Chemical Hazard Prediction, 1987, CRDEC-TR-87021, Chemical Research, Development and Engineering Center.

3.0 Report Organization

This report consists of two volumes, containing the following information:

a. **Volume 1 (this document; UNCLASSIFIED) contains the description of** the methodology, data and results of this study. **The major sections of this volume are:**

(1) Section 4 presents the TEAD site-specific meteorological data and actual distances from the TEAD CSDP disposal facility to the TEAD South Area installation boundary. This data is used in the dispersion and frequency calculations described in Sections Six and Seven.

(2) Section 5 describes the internally initiated (process dependent) FPEIS Credible Catastrophic Accidents for the TEAD CSDP disposal facility and shows their location within the disposal facility. Since the publication of the FPEIS the CAMDS bulk facility has been eliminated, therefore only the internally initiated plant operating accident scenarios for the TEAD CSDP disposal facility are used in this study.

(3) Section 6 describes the results of the atmospheric dispersion calculations. The Army's atmospheric dispersion model D2PC is used to determine the No Deaths (ND) hazard distances for each of the Credible Catastrophic Accidents listed in Section Five based on the meteorological data from Section Four. The results of these calculations are then compared to the

actual TEAD South Area boundary distances to determine which scenarios under which conditions result in off-post excursions.

(4) <u>Section 7</u> describes the methodology used to determine the frequency of the meteorological conditions (identified in Section Six) which permit off-post excursions, as well as the methodology used to determine the TEAD site specific Credible Catastrophic Accident probabilities. Although Section Seven lists the TEAD site specific Credible Catastrophic Accident scenarios, the scenario probabilities are classified SECRET and are therefore contained in Appendix C/Volume II.

(5) <u>Section 8</u> describes the evaluation of three disposal scenarios, restricted disposal operations, unrestricted disposal operations, and partially restricted disposal operations, to determine which scenario presents the lowest total risk to the public. The total risk is based on the risks associated with the chemical munition storage, handling and transportation and disposal.

(6) <u>Section 9</u> contains the conclusions and recommendations of the study.

b. Volume II (classified SECRET) consists of Appendix C and contains the classified data used or generated in this study. Specifically Volume II contains the results of the FPEIS risk analyses for TEAD, information on the TEAD stockpile, the meteorologically corrected accident probabilities, the milestone schedules and programmatic risk worksheets used in Section eight.

4.0 TEAD Site Specific Data.

4.1 Geography

a. TEAD is located in north-central Utah (Figure 4-1). As shown in Figure 4-2, the depot consists of two areas approximately 15 miles apart; the chemical munitions are located in the "South Area". The "North Area" of TEAD is located in the southern part of Tooele Valley, approximately two miles from the city of Tooele and twenty-nine miles southwest of Salt Lake City. The small town of Stockton is located approximately three miles south of the North Area. The South Area occupies 19,364 acres in Rush Valley, sixteen miles south of the city of Tooele and 43 miles south-southwest of Salt Lake City. Immediately to the southwest and west of the South Area are the small farming villages of Vernon, Clover, and St John. The nearest Community of significant size, other than Tooele, is Lehi, located approximately 43 miles east of the South Area.

b. The Tooele and Rush Valleys are bounded on the east by the Oquirrh Mountains and on the west by the Stansbury and Onaqui Mountains. The average elevation of the Tooele and Rush valleys are 4,920 feet and 5,300 feet respectively. The two valleys are separated by a large natural dike-like formation located approximately two miles south of the North Area. The Tooele Valley is terminated approximately fifteen miles north of the Depot by the Great Salt Lake. The a ea surrounding the South Area is agriculture and open range land.

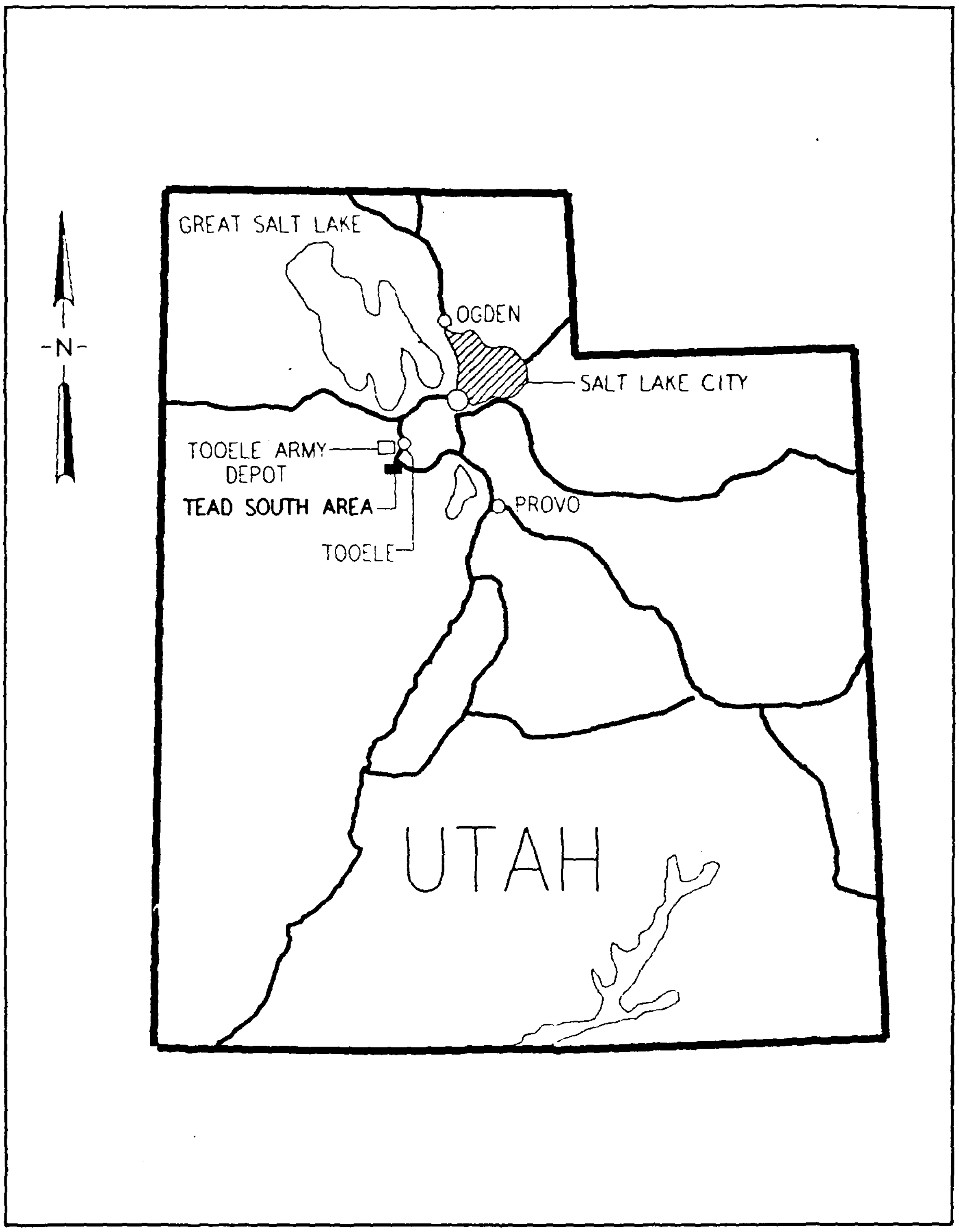

Figure 4-1: General Location of Tooele Army Depot (TEAD)

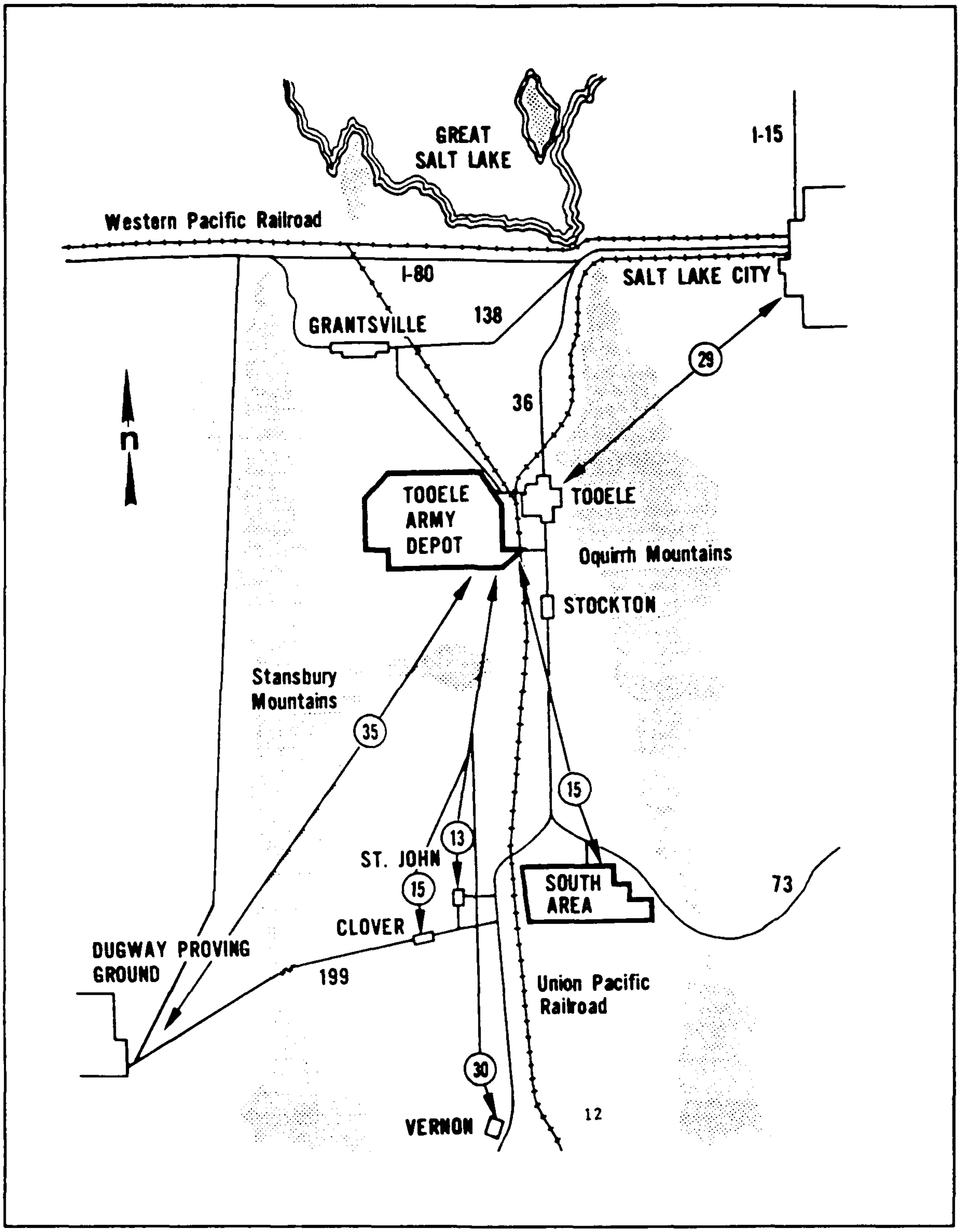

Figure 4-2: TEAD Geography

c. The chemical agents and munitions are stored in a secure compound known as "Area 10" which is located in the northwest quadrant of the South Area as shown in Figure 4-3. The CSDP disposal facility will be located adjacent to the southeast corner of Area 10, roughly in the center of the South Area. Table 4-1 lists the distances from the center of the disposal facility to the depot boundary. Figure 4-4 illustrates the facility-to-boundary distances in an array similar to a wind rose. The actual distances from the CSDP disposal facility to the TEAD South Area boundaries are 6.6 to 13 times greater than the 500 meters used in the FPEIS.

4.2 Meteorology.

With the exception of the Height of Mixing Layer data, the following meteorology data was obtained from CH2M Hill, a commercial engineering consultant firm who prepared the CSDP disposal facility Resource Conservation and Recovery Act (RCRA)(1) and Clean Air(2) permit applications.

a. **Diurnal Cycle.** Diurnal cycle refers to the daily cycle of daytime and nighttime. The sunrise and sunset times were calculated using the CRSTER preprocessor based on the Julian date, longitude of the TEAD South Area and the time zone(3). The times listed in Table 4-2 are monthly averages of the daily times calculated by the CRSTER preprocessor.

b. **Hourly Atmospheric Stability Classification.**

(1) Atmospheric stability is a term which describes the amount of mixing or turbulence which occurs in the air and is divided into three broad

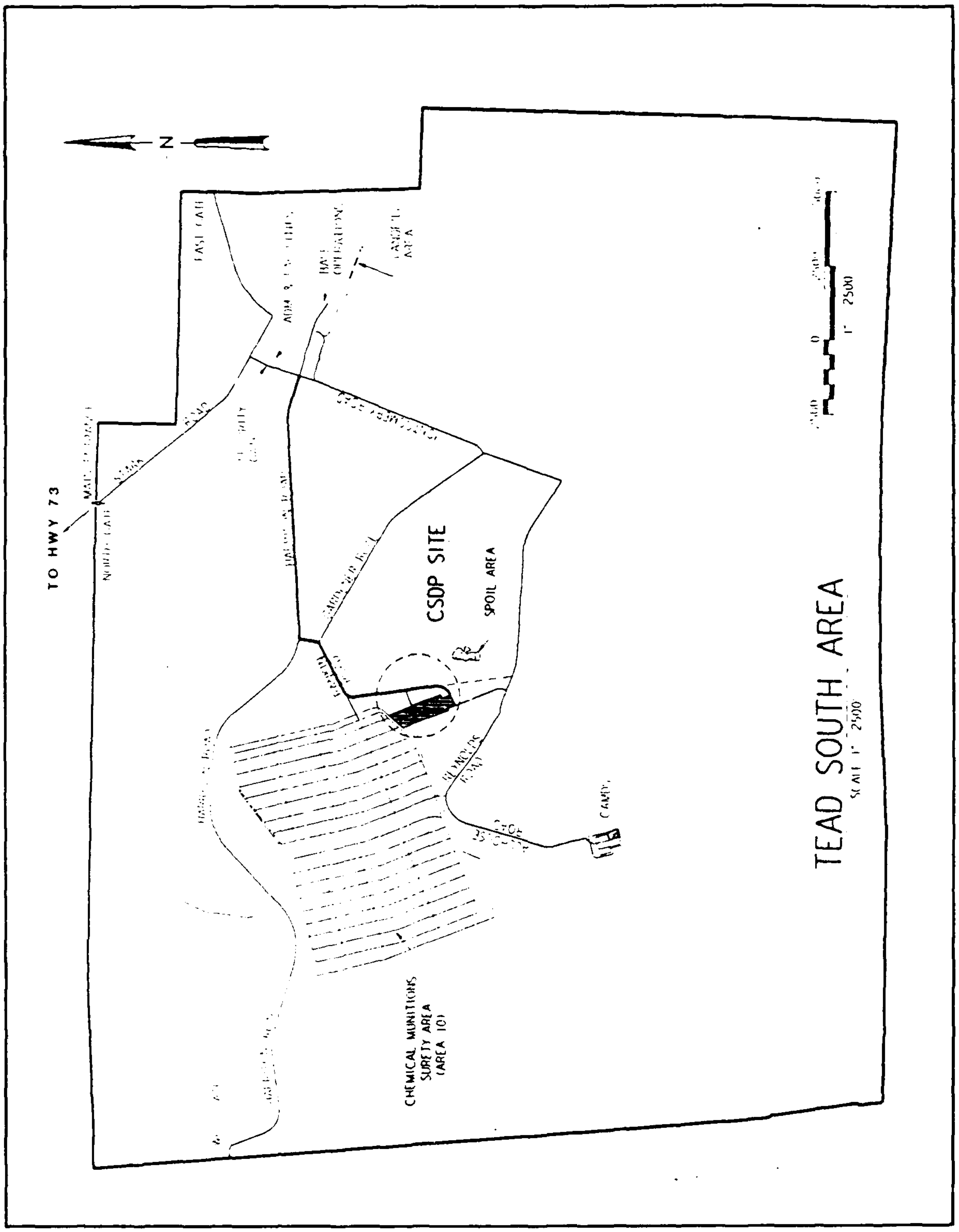

Figure 4-3: Location of CSDP Disposal Facility Within TEAD South Area

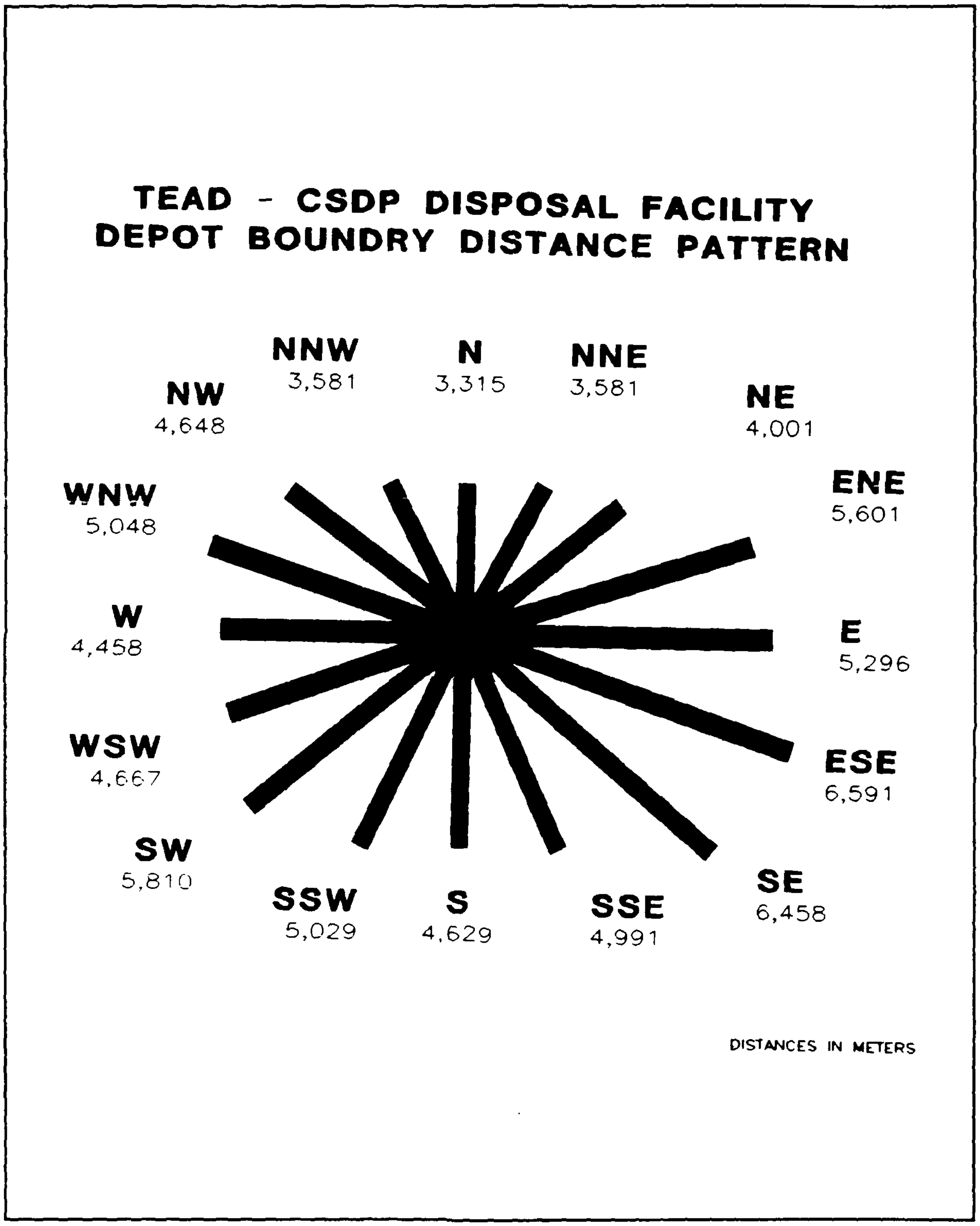

Figure 4-4: CSDP Disposal Facility to TEAD Boundary Distance Pattern

classes: unstable (lapse), neutral, and stable (inversion). The amount of turbulence in the atmosphere is dependent on two primary forces: solar radiation (thermal) and wind (mechanical). A turbulent atmosphere is said to be unstable and conversely, an atmosphere with suppressed turbulence is stable. A chemical agent cloud introduced into an unstable atmosphere will tend to dissipate quickly due to the enhanced mixing, while the suppressed turbulence in a stable atmosphere will result in larger concentrations and downwind hazard distances. An atmosphere with neutral stability will produce concentrations between that of stable and unstable.

(2) The accepted method of classification of hourly atmospheric stability is based on the research performed by Dr. F. Pasquill[(4)]. Based on his research, Dr. Pasquill established six stability categories as follows: (A) Extremely unstable, (B) Unstable, (C) Slightly Unstable, (D) Neutral, (E) Slightly stable, and (F) Stable. Table 4-3, gives the stability class as a function of wind speed and net radiation based on the system developed by Turner[(5)]. The net radiation index ranges from four (4), highest positive net radiation (directed toward the ground), to minus two (-2), lowest negative radiation (directed away from the earth) and is a function of solar elevation, cloud cover and cloud height. Neutral stability occurs with overcast skies, high winds or at sunrise and sunset. The highest (F) and lowest (A) atmospheric stabilities occur during light winds with unstable conditions existing during high radiation and stable conditions existing during negative radiation. It is important to note that **stable atmospheric conditions (E and F stability) only occur during nighttime which is defined as from one hour**

Table 4-1: CSDP Disposal Facility to TEAD South Area Depot Boundary Distances

Direction	Distance (Feet)	Distance (Meters)
N	10,875	3,315
NNE	11,750	3,581
NE	13,125	4,001
ENE	18,375	5,601
E	17,375	5,296
ESE	21,625	6,591
SE	21,188	6,458
SSE	16,375	4,991
S	15,188	4,629
SSW	16,500	5,029
SW	19,063	5,810
WSW	15,313	4,667
W	14,625	4,458
WNW	16,563	5,048
NW	15,250	4,648
NNW	11,750	3,581

Table 4-2: TEAD South Area Sunrise and Sunset Data

MONTH	SUNRISE (HOURS) AVERAGE	EARLIEST	LATEST	SUNSET (HOURS) AVERAGE	EARLIEST	LATEST
JANUARY	07:52	07:45	07:57	17:20	17:06	17:37
FEBRUARY	07:28	07:11	07:44	17:55	17:39	18:12
MARCH	06:45	06:21	07:10	18:28	18:13	18:45
APRIL	05:57	05:36	06:19	18:59	18:45	19:15
MAY	05:18	05:07	05:34	19:30	19:16	19:44
JUNE	05:03	05:03	05:06	19:52	19:45	19:57
JULY	05:15	05:06	05:28	19:51	19:42	19:57
AUGUST	05:42	05:28	05:57	19:22	19:01	19:40
SEPTEMBER	06:11	05:58	06:25	18:34	18:11	18:59
OCTOBER	06:42	06:26	06:58	17:45	17:25	18:09
NOVEMBER	07:17	07:00	07:34	17:09	17:00	17:24
DECEMBER	07:47	07:36	07:56	16:59	16:58	17:05

<u>before sunset to one hour after sunrise; for the balance of the day, the most stable atmospheric condition which can exist is neutral or Pasquill stability category D</u>.

(3) The hourly atmospheric stability at TEAD was calculated by CH2M Hill using the CRSTER Model based on the time of day, solar elevation,

Table 4-3: Pasquill Stability Categories as a Function of Net Radiation and Wind Speed

Wind Speed (Knots)	Net Radiation Index						
	4	3	2	1	0	-1	-2
0, 1	A	A	B	C	D	F	F
2, 3	A	B	B	C	D	F	F
4, 5	A	B	C	D	D	E	F
6	B	B	C	D	D	E	F
7	B	B	C	D	D	D	E
8, 9	B	C	C	D	D	D	E
10	C	C	D	D	D	D	E
11	C	C	D	D	D	D	D
$\geq$ 12	C	D	D	D	D	D	D

cloud cover and height observations and the wind speed. The first four values are used to determine the amount of solar radiation by the method developed by Turner. The amount of solar radiation is then compared to the wind speed to determine the Pasquill Stability category.

(4) Table 4-4 lists the average annual and seasonal frequencies for each Pasquill stability category based on the hourly stability calculations performed by CH2M Hill, monthly averages are contained in Table D-1. It should be noted that the CRSTER model restricts changes in stability to one class per hour, because of this conservatism, the stable atmospheric

conditions listed in Table 4-4 exist from one hour before sunset to two hours after sunrise. Pasquill stability category A does not occur during the fall or winter because of the low solar angle (i.e. low solar radiation). The annual 24-hour distribution of the categories is illustrated in Figures 4-5; it is important to note that **Neutral or D stability occurs 24-hours a day** with the highest frequencies occurring at sunrise and sunset.

Table 4-4: Annual and Seasonal Pasquill Stability Frequencies

Pasquill Stability Category	Average Frequency				
	Annual	Winter	Spring	Summer	Fall
A	**0.0128**	0.0000	0.0140	0.0367	0.0000
B	**0.0801**	0.0074	0.0960	0.1386	0.0769
C	**0.1316**	0.1301	0.1273	0.1345	0.1346
D	**0.3958**	0.4301	0.4348	0.3678	0.3507
E	**0.1826**	0.2005	0.1680	0.1658	0.1969
F	**0.1970**	0.2319	0.1599	0.1567	0.2408

c. **Wind Speed and Direction.**

(1) Wind speed and direction measurements from November 1986 through October 1987 were used to generate the wind roses shown in Figures 4-6 through 4-11; the average annual frequencies are listed in Appendix D. The

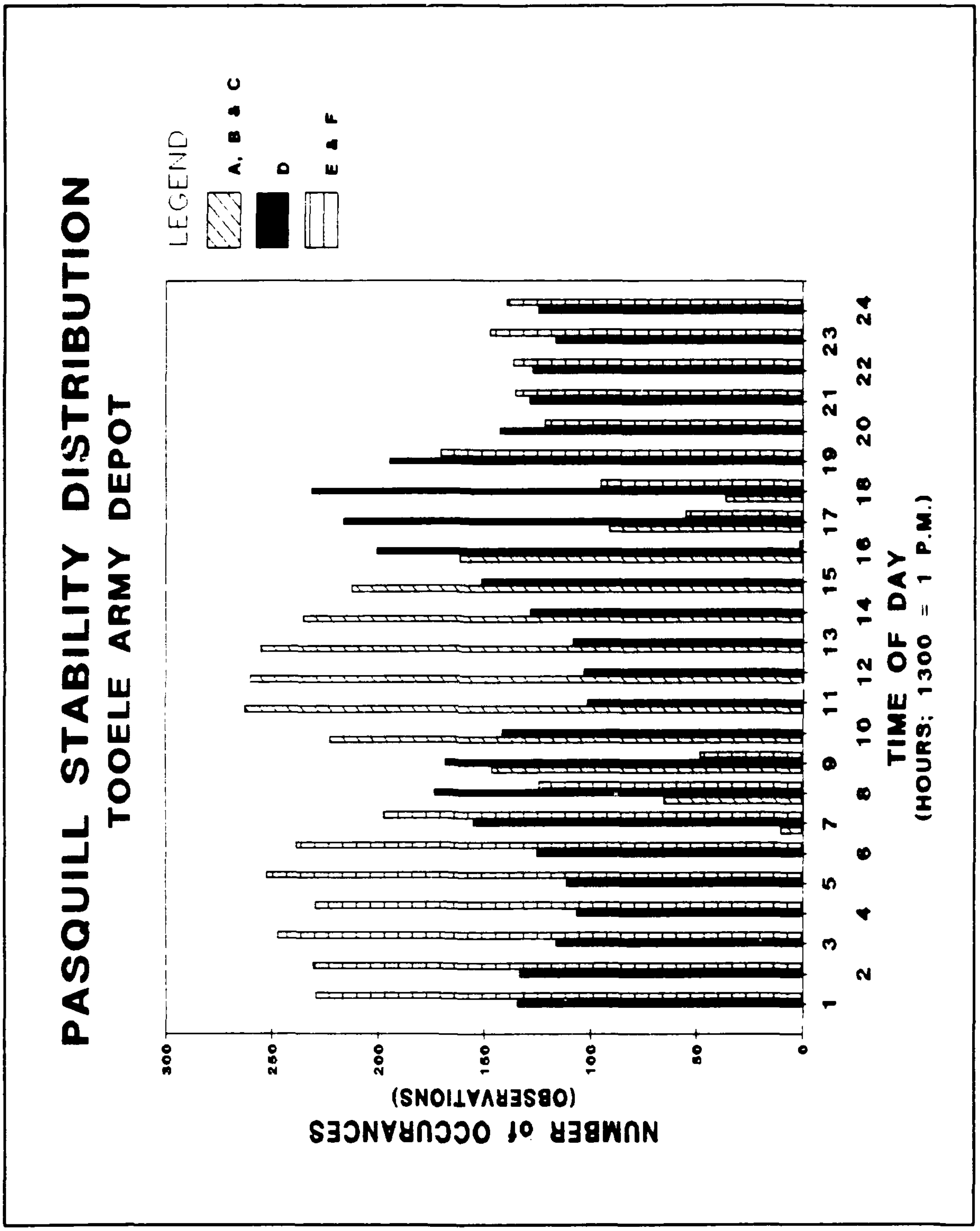

Figure 4-5: 24-Hour Pasquill Stability Distribution - Tooele Army Depot

data was collected from station number nine of the perimeter monitoring network located in the TEAD South Area in support of the Chemical Agent Munitions Disposal System (CAMDS), which is the Army's test facility for processes, procedures and equipment being considered for use in future chemical agent/munition disposal facilities. Station number nine was selected as it was the closest to the proposed location of the CSDP disposal facility.

(2) As shown in Figures 4-6 through 4-11, the prevailing winds during the day (Pasquill stability categories A - D are from the north-northwest, with a secondary peak from the south-southeast; This trend reverses itself during the night (Pasquill stability categories E and F) with the prevailing wind from the southeast and east-southeast, with a secondary peak from the north-northwest. By comparison with Figure 4-2, it is seen that the winds are aligned with Tooele and Rush valleys.

d. Height of Mixing Layer

(1) The Mixing Layer is the portion of the atmosphere next to the surface where vigorous mixing due to thermal and mechanical turbulence occurs. Above the mixing layer an inversion, or stable air mass, exists which tends to prevent mixing with the air above. Therefore the distance from the ground to the bottom of the first inversion is called the mixing layer or depth. At distances close to the source, the mixing layer height does not affect the downwind hazard distance. However, if the agent cloud reaches the

mixing layer, the fraction of the cloud reaching the boundary is reflected back to reinforce the ground level concentration and increase the concentration within the mixing layer.

(2) Table 4-5 lists the height of the mixing layer for TEAD for each season as a function of Pasquill stability. The data was obtained from Salt Lake City airport during 1960 through 1964(6). The height of the mixing layer depends directly upon the amount of turbulence in the lowest levels of the atmosphere - its height will increase with increased turbulence/mixing of this air, i.e. when the atmosphere becomes more unstable. In relative terms, solar radiation has more of an effect on the height of the mixing layer than wind. This explains why the mixing heights are lower in the fall and winter than in the spring and summer.

Table 4-5: Median Height of Mixing Layer for TEAD South Area

Pasquill Stability Category	Median Mixing Depth (meters) Season			
	Winter	Spring	Summer	Fall
A	540	2310	3625	1470
B	540	2310	3625	1470
C	377	1277	1892	845
D	215	245	200	220
E	100	150	100	100
F	50	100	80	80

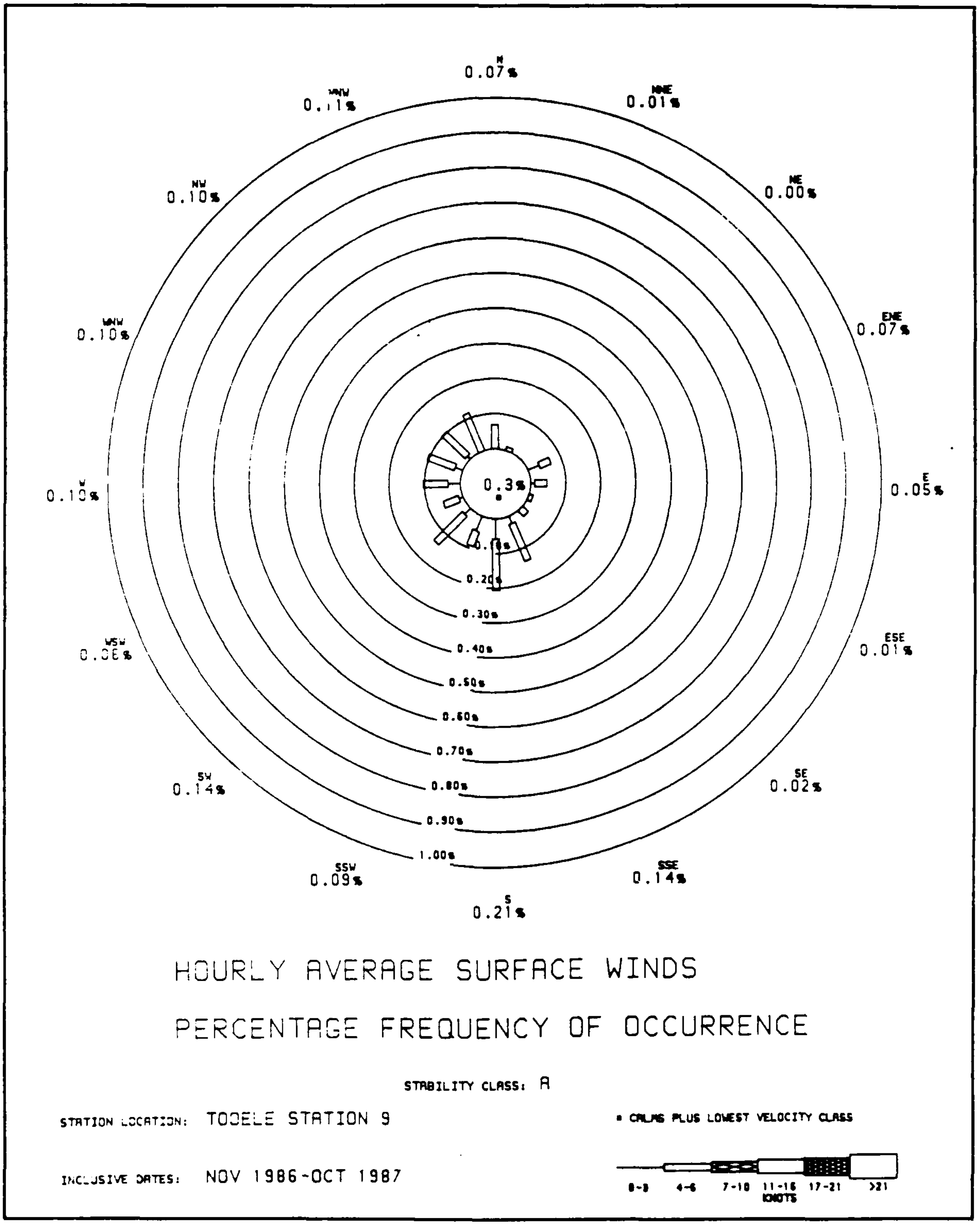

Figure 4-6: **TEAD South Area Wind Rose; Pasquill Stability Class A**

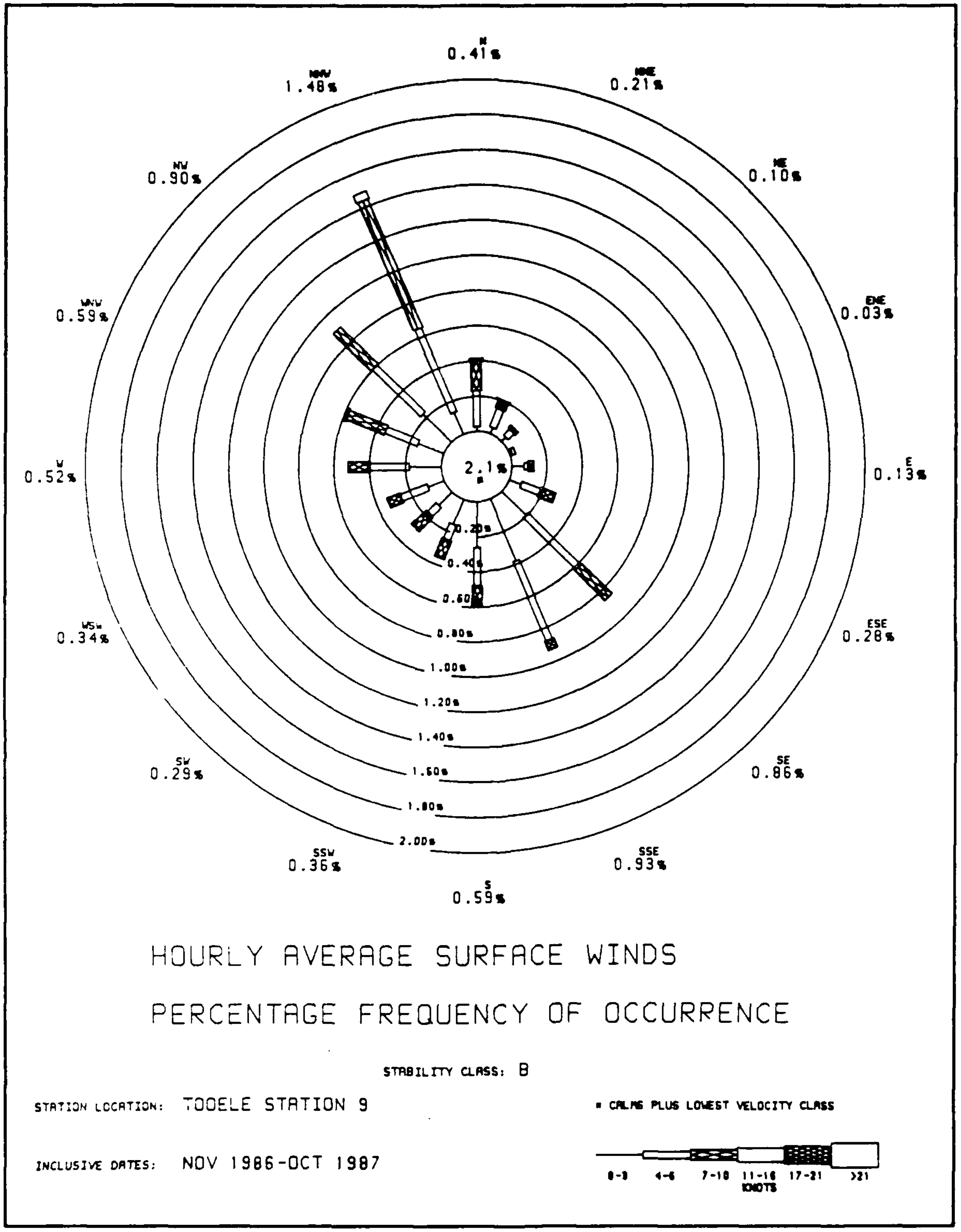

Figure 4-7: TEAD South Area Wind Rose; Pasquill Stability Category B

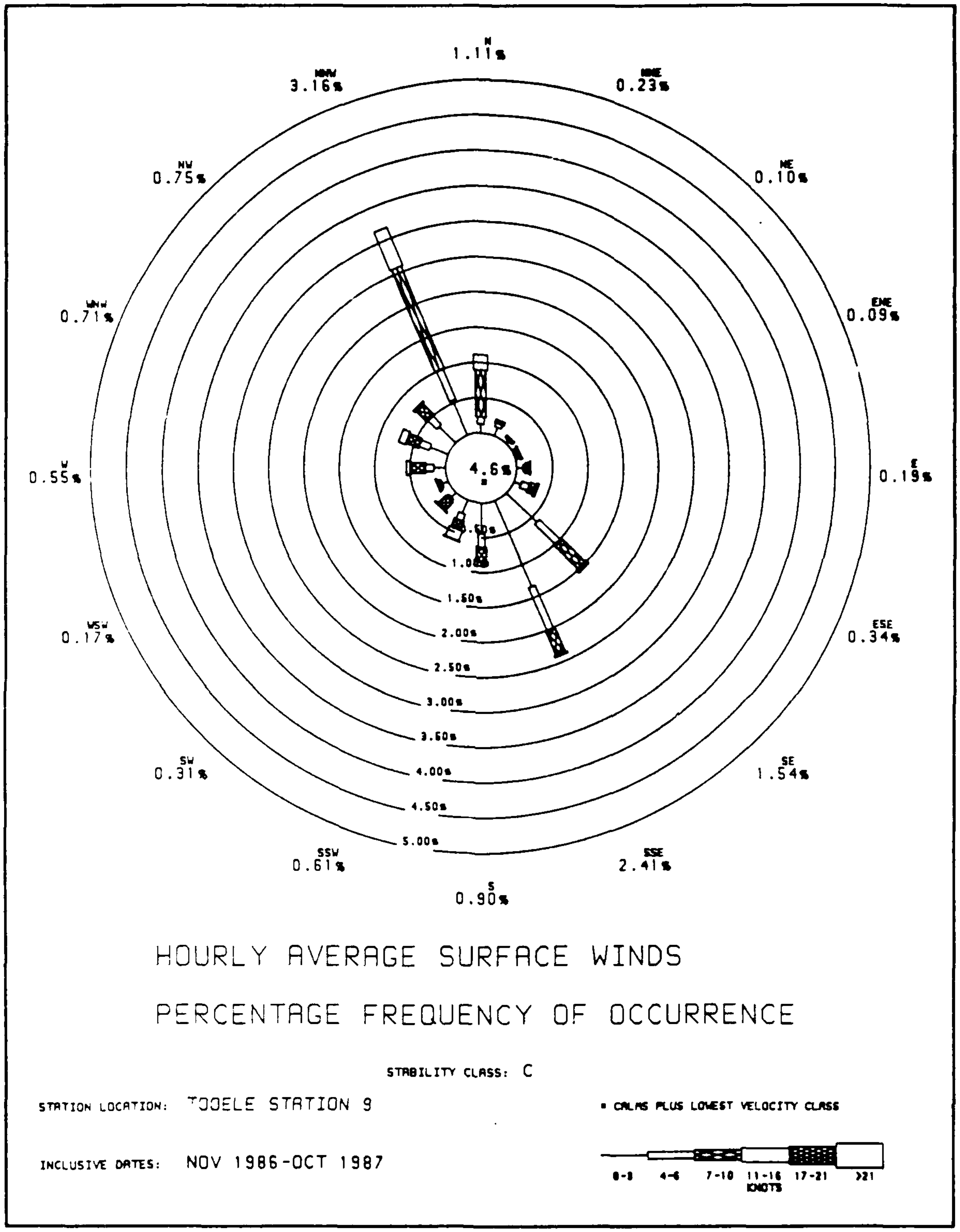

Figure 4-8: TEAD South Area Wind Rose; Pasquill Stability Category C

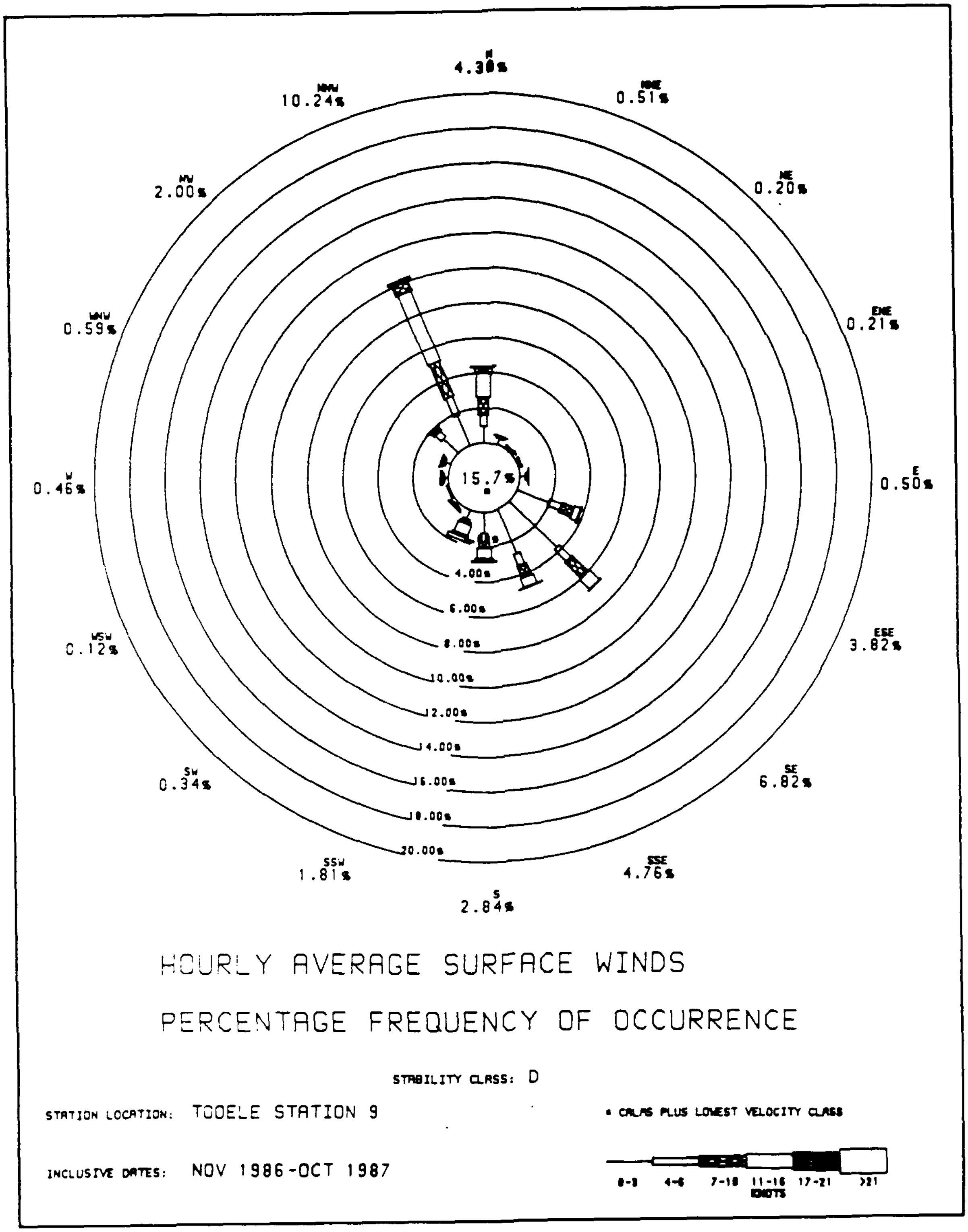

Figure 4-9: TEAD South Area Wind Rose; Pasquill Stability Category D

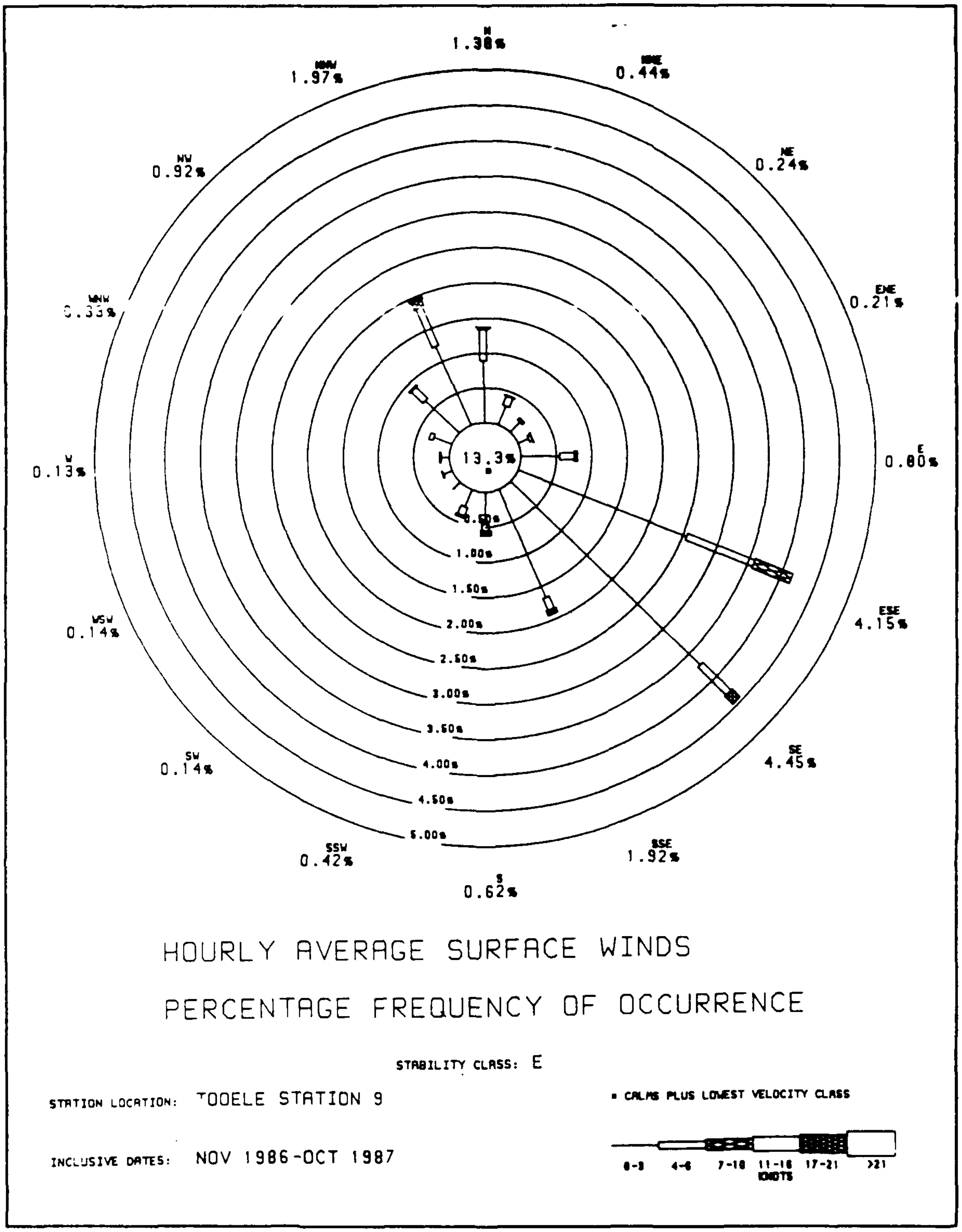

Figure 4-10: TEAD South Area Wind Rose; Pasquill Stability Category E

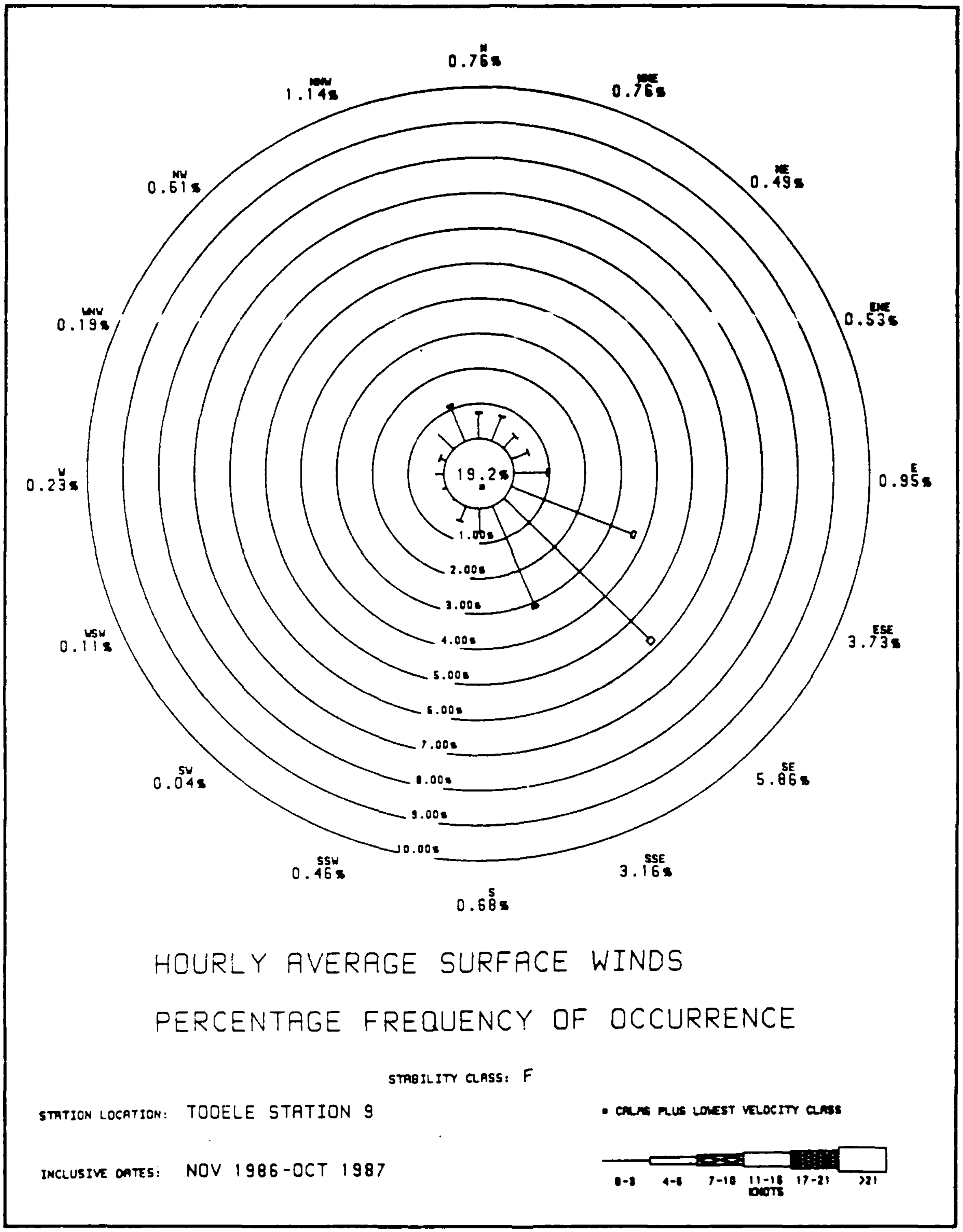

Figure 4-11: TEAD South Area Wind Rose; Pasquill Stability Category F

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1. Resource Conservation and Recovery Act Hazardous Waste Permit Application for the Department of the Army Tooele Army Depot Chemical Stockpile Disposal System, September 1988, Revision 3, Tooele Army Depot.

2. Notice of Intent to Construct for the Department of the Army Tooele Army Depot Chemical Stockpile Disposal System, Revision 1, 24 March 1987, Tooele Army Depot.

3. User's Manual for Single-Source (CRSTER) Model, EPA-450/2-77-013, July 1977, U.S. Environmental Protection Agency.

4. Pasquill, F., D.Sc, "The Estimation of the Dispersion of Windborne Material", Meteorological Magazine, Vol. 90, No. 1,063, February 1961.

5. Turner, D., D. Bruce, Journal of Applied Meteorology, Vol. 3, February 1964, pp 83-91.

6. Handbook for Chemical Hazard Prediction, DARCOM Handbook No. 385-2.1-80, Appendix D, February 1980, United States Army Material Development and Readiness Command.

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5.0 FPEIS Credible Catastrophic Accident Scenarios

a. The accidents associated with disposal plant operations can be divided into two categories: internally initiated and externally initiated. Internally initiated events are dependent on the chemical munition or agent being processed in the disposal facility. Externally initiated events involve earthquakes, tornados, meteor strikes, plane crashes and other initiating events which the disposal plant operators have no control over.

b. Except when disposal operations are stopped for an extended period of time, chemical agent/munitions will be continuously present in the disposal facility. Therefore the risks associated with externally initiated accidents will be independent of whether disposal operations are conducted on an unrestricted or meteorologically restricted basis. For this reason, only the meteorological effects on the internally initiated (process dependent) accident scenario hazard distances will be evaluated in Section Six.

c. The descriptions of the FPEIS process dependent accident scenarios are listed in Table 5-1[1]; Figures 5-1, 5-2 and 5-3 show the location of the scenarios within the disposal facility. Table 5-2 lists the type, amount, method and duration of chemical agent release for each scenario[2]; the asterisked scenarios are modeled as semi-continuous releases for two minutes (see paragraph 6.2.b(3) for further explanation). Note that not all possible chemical agents/munitions combinations are credible for each process dependent accident scenario (e.g. VX or Mustard are not listed in Table 5-2 of scenario

Table 5-1: Process Dependent Accident Scenario Descriptions

Scenario ID Number	Scenario Description
PO-abc-041	Failure to stop agent feed to Liquid Incinerator (LIC) after LIC and Pollution Abatement System, (PAS) has been shutdown. Agent vapors fill room and overload the ventilation system (carbon filters).
PO-abc-042	Metal Parts Furnace (MPF) explosion due to failure to stop fuel flow after a shutdown.
PO-abc-045	Ton container is spilled in the Explosion Containment Vestibule (ECV). Munitions Demilitarization Building (MDB) structure fails due to subsequent agent fire.
PO-abc-049	Munition detonation in Explosion Containment Room (ECR) causes structural and ventilation system failure.
PO-abc-050	Munition detonation in ECR causes structural failure, a fire, and ventilation failure.
PO-abc-051	Ton container spill in the Munitions Processing Bay (MPB). MDB structure fails due to subsequent fire.
PO-abc-052	A burstered munition is fed to the Dunnage Incinerator (DUN).

Key: **a - Type of Munition/Container**
(A-All, B-Bomb, C-Cartridge, D-Mortar, K-Ton Container, M-Mine, P-Projectile (155 mm), Q-Projectile (8-in), R-Rocket, S-Spray Tank)

b - Type of chemical agent
(G-GB (Sarin), H-H/HD/HT (Mustard), V-VX)

c - Method of release
(C-Complex (indoor release affected by building systems), F-Fire)

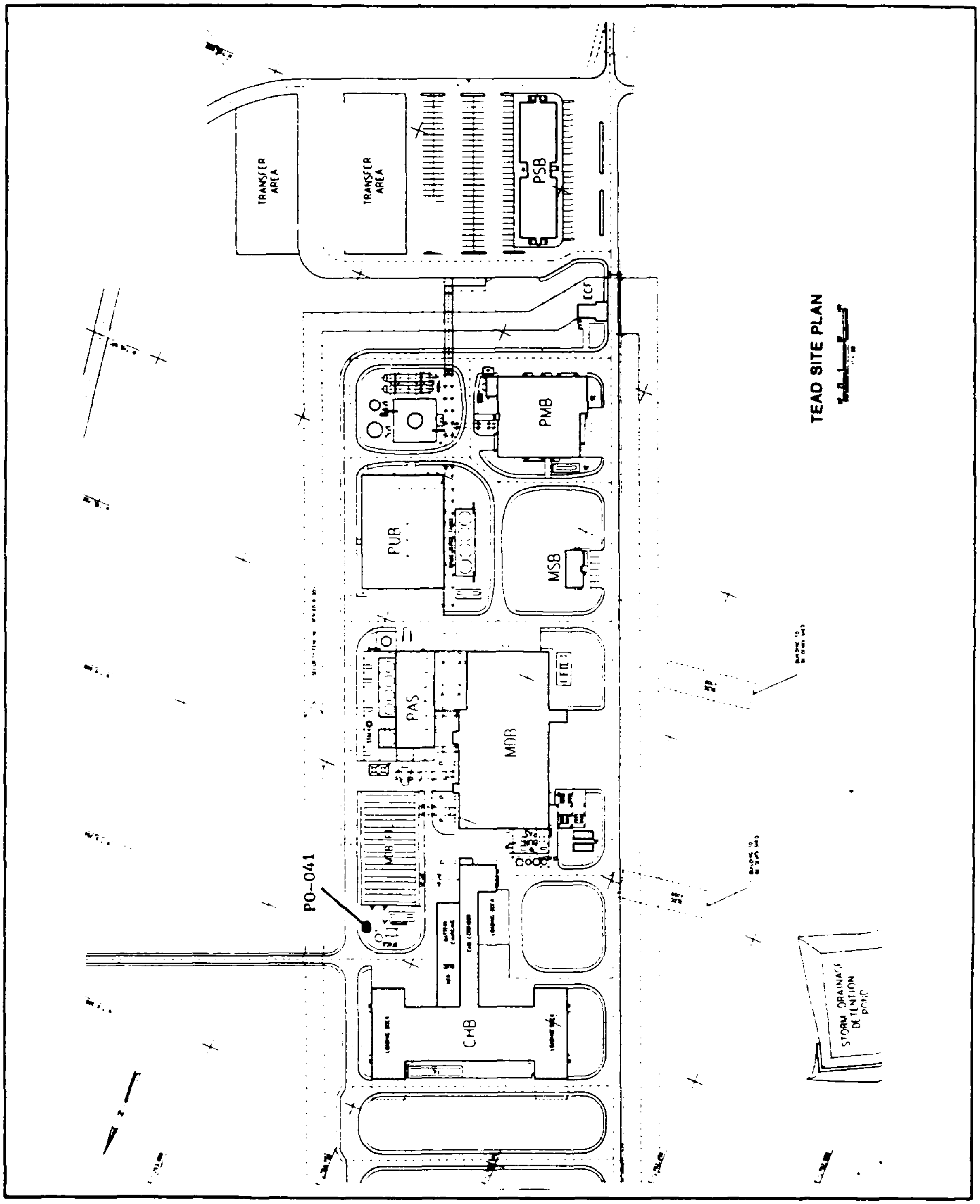

Figure 5-1: TEAD CSDP Disposal Facility Site Plan (PO-041 Release Point)

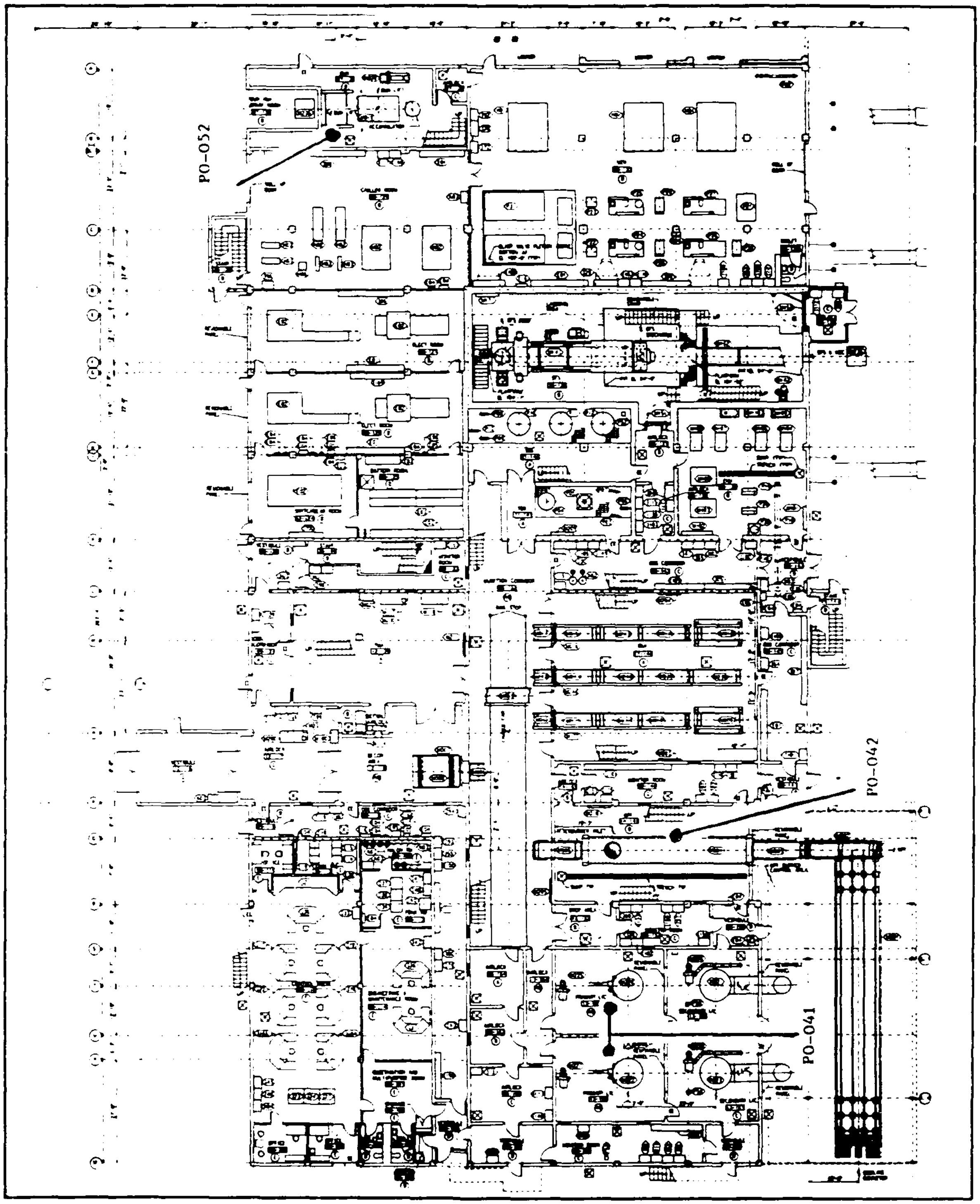

Figure 5-2: TEAD MDB First Floor Plan (Scenarios PO-041, PO-042 and PO-052)

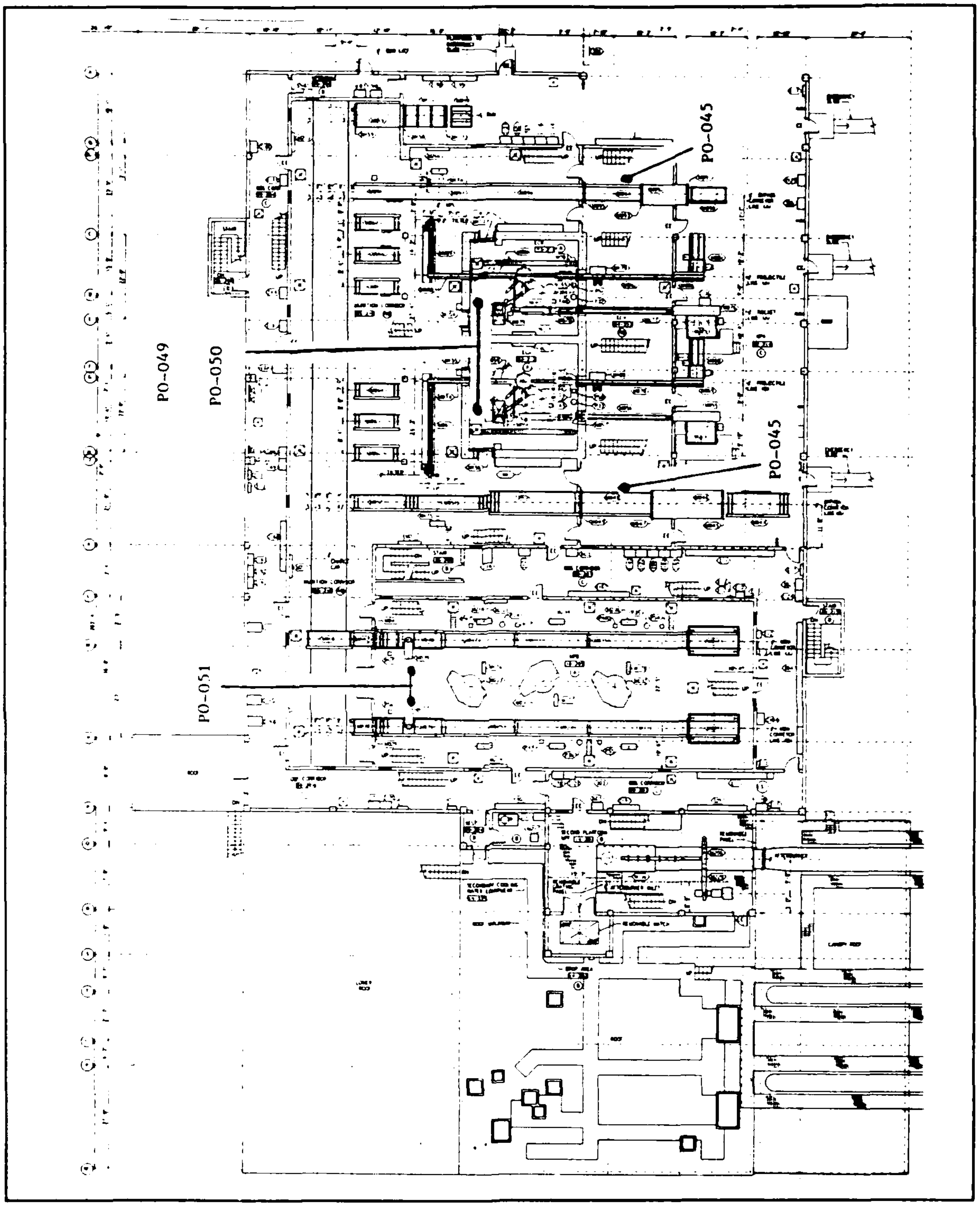

Figure 5-3: TEAD MDB Second Floor Plan (Scenarios PO-045, PO-49, PO-050 and PO-051)

Table 5-2: Process Dependent Accident Scenario Release Parameters

Scenario ID Number	Amount of Release (pounds) Detonation	Vapor	Release Time (minutes)
PO-AGC-041	0.000	101.391	15
PO-BGC-042	0.000	21.979	12
PO-CGC-042	0.000	5.794	12
PO-KGC-042	0.000	35.237	12
PO-KHC-042	0.000	42.462	12
PO-KVC-042	0.000	39.994	12
PO-PGC-042	0.000	15.596	12
PO-SVC-042	0.000	33.884	12
PO-KGF-045	0.000	50.350	106
PO-CGC-049	1.600	0.000	0
PO-PGC-049	6.501	0.000	0
PO-PVC-049 *	5.998	0.000	0
PO-QGC-049	14.488	0.000	0
PO-RGC-049	10.691	0.000	0
PO-RVC-049 *	10.000	0.000	0
PO-CGC-050	1.600	0.000	0
PO-PGC-050	6.501	0.000	0
PO-PVC-050 *	5.998	0.000	0
PO-RGC-050	10.691	0.000	0
PO-RVC-050 *	10.000	0.000	0
PO-KGF-051	0.000	28.973	61
PO-KHF-051	0.000	17.989	69
PO-CGC-052	1.600	0.000	0
PO-MVC-052 *	10.495	0.000	0
PO-RGC-052	10.691	0.000	0
PO-RVC-052 *	10.000	0.000	0

NOTE: * - Modeled as a semi-continuous release for two minutes

PO-041); this is because either the quantity of agent or munitions was insufficient for the scenario to have a programmatic probability of 10^{-8} or greater, or the resulting hazard distance was less than 500 meters.

REFERENCES

1. Risk Analysis in Support of the Chemical Stockpile Disposal Program, December 1987, SAPEO-CDE-IS-87014, Program Executive Officer-Program Manager for Chemical Demilitarization.

2. Risk Analysis of the Onsite Disposal of Chemical Munitions, August 1987, SAPEO-CDE-IS-87010, Program Executive Officer-Program Manager for Chemical Demilitarization.

6.0 Off-Post Excursion Determination.

6.1 D2PC Atmospheric Dispersion Model.

a. The Army's D2PC atmospheric dispersion model[1] was used to determine the ND downwind hazard distances resulting for each of the FPEIS Credible Catastrophic Accidents scenarios listed in Table 5-2. The ND dosages (time weighted concentrations) for chemical agents GB, VX and HD are listed in Table 6-1. The ND dosage is the largest dosage which would result in no fatalities to healthy adults breathing at a rate of 25 liters per minute which is equivalent to moderate activity.

Table 6-1: Chemical Agent No Deaths Dosage Values

Chemical Agent	No Deaths Dosage ($mg\text{-}min/m^3$)
GB	6.0
VX	2.5
HD	100.0

b. D2PC is an air diffusion model that assumes a Gaussian plume distribution of agent in the vertical and crosswind directions as the agent disperses downwind. Extensive source term information, to include release characteristic information on the various chemical munitions in the unitary

chemical stockpile are included in D2PC. Due to the complex nature of the materials, D2PC also includes the effects on evaporation and surface type. Powerful dose conversion subroutines are included to determine both inhalation and actual exposure pathways in estimating the downwind distances and areas for selected chemical agent levels/concentrations.

c. The model assumes steady-state dispersion with straight-line cloud travel over flat open terrain; in addition, the recipient is assumed to be directly in the center of the agent cloud and is exposed to the total dosage (the entire cloud passes that point and the recipient does not move). Therefore the hazard distances estimated by D2PC are considered to be conservative (longer than would actually occur). Although this conservatism is acceptable close to the agent source, it becomes unrealistic at distances greater than 20 kilometers because of the different dispersion mechanisms involved with mesoscale meteorological circulations and diurnal variations.

6.2. Hazard Distance Determination.

a. The site specific meteorological data (wind speed and mixing layer height) from Section Four and the release parameters listed in Table 5-2 were used in the D2PC model to determine the ND hazard distances for each scenario. Except for using this data, the same modeling approach which was used by MITRE Corporation and Oak Ridge National Laboratory (ORNL) in support of the FPEIS[2] was used in this report.

b. Two chemical agent release modes were used to characterize the

initial dispersion of chemical agent: "instantaneous" and "semi-continuous".

(1) Instantaneous release was used to characterize the initial dispersion of chemical agent from detonating GB filled munitions. The instantaneous D2PC source codes are based on actual open air testing conducted prior to 1969 using chemical agent filled munitions and are characterized by temperature-dependent yield factors. However, as indicated by the descriptions in Table 5-1, the actual accident scenarios are more complicated than this, involving elevated temperatures, fires, dispersion restrictions created by the demilitarization facility and processes, and other factors which invalidate the munition-based D2PC instantaneous source codes. Therefore GB detonation scenarios were modeled by specifying "non-munition" and assuming that 100% of the agent was released.

(2) Semi-continuous release was used to characterize a chemical agent vapor release over a finite period of time. Both the quantity and duration of release are used to characterize the scenario. Typically these scenarios involved vaporization of the chemical agent by a fire. All releases were assumed to occur at ground level at ambient conditions; no credit was taken for the reduction in ground-level concentrations resulting from an elevated release (e.g. from the filter stack or for thermal plume rise) as compared to a ground level release of the same magnitude.

(3) The D2PC instantaneous source codes for detonating HD and VX filled munitions are based primarily on aerosol or droplet dispersion. Although D2PC accounts for the vapor hazards from the evaporating droplets,

MITRE and ORNL felt the algorithm under estimated this agent source and elected to model HD and VX instantaneous releases as semi-continuous releases lasting two minutes[2].

c. An initial screening of the scenarios listed in Table 5-2 showed that no off-post excursions occurred under Pasquill stability categories A, B or C, therefore hazard distances were determined only for Pasquill stability categories D, E and F. The worksheet illustrated in Figure 6-1 was completed for each scenario. Temperature values were not required since the D2PC source codes for detonating chemical munitions were not used (see paragraph 6.2.b(1)) and none of the scenarios involved chemical agent evaporation from a spill or puddle. The wind speed values are the average speeds for each of the corresponding ranges shown in Figures 4-9, 4-10 and 4-11. The mixing layer height values are the lowest seasonal height for each Pasquill stability category; as shown in Table 4-5, the seasonal variations for Pasquill categories D through F are small, therefore the minor conservative error induced by using the lowest seasonal mixing layer height on an annual basis was determined to be acceptable given the uncertainty inherent with atmospheric dispersion modeling (± 50%).

d. Section One of Appendix E contains the completed worksheet for each of the FPEIS Credible Catastrophic Accident scenarios listed in Table 5-2. The maximum ND hazard distances created by each scenario under each Pasquill stability category are listed in Table 6-2; because of the reasons described in paragraph 6.1.c, computed hazard distances greater than 20 kilometers are

METEOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: ________________
AGENT: ________
SEASON: ALL

MODE: ________

AMOUNT: ________lbs ____________________mg

To convert from lbs to mg multiply by 453,592

TQ: ________min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	________
			5.00	5.75	2.57		________
			8.50	9.78	4.37		________
			13.50	15.54	6.94		________
			19.00	21.86	9.77		________
			21.00	24.17	10.80		________

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	________
			5.00	5.75	2.57		________
			8.50	9.78	4.37		________
			N/A	N/A	N/A		________
			N/A	N/A	N/A		________
			N/A	N/A	N/A		________

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	________
			5.00	5.75	2.57		________
			N/A	N/A	N/A		________
			N/A	N/A	N/A		________
			N/A	N/A	N/A		________
			N/A	N/A	N/A		________

Figure 6-1: Meteorological Dispersion Worksheet

Table 6-2: Maximum Hazard Distance Distribution (Distance versus Pasquill Stability Category)

SCENARIO ID NUMBER	MAXIMUM NO DEATHS HAZARD HAZARD DISTANCE (meters)		
	D	E	F
PO-AGC-041	4,509	11,963	>20,000
PO-BGC-042	2,048	3,580	12,855
PO-CGC-042	101	1,667	3,587
PO-KGC-042	2,621	4,808	>20,000
PO-KHC-042	786	1,321	2,940
PO-KVC-042	4,410	11,393	>20,000
PO-PGC-042	1,704	2,933	8,950
PO-SVC-042	4,083	9,726	>20,000
PO-KGF-045	2,530	4,934	>20,000
PO-DHC-049	257	389	755
PO-CGC-049	810	1,284	2,499
PO-PGC-049	1,632	2,739	7,387
PO-PHC-049	376	590	1,196
PO-PVC-049	1,719	2,875	8,238
PO-QGC-049	2,435	4,313	17,105
PO-RGC-049	2,092	3,607	12,452
PO-RVC-049	2,219	3,813	14,052
PO-DHC-050	257	389	755
PO-CGC-050	810	1,284	2,499
PO-PGC-050	1,632	2,739	7,387
PO-PHC-050	376	590	1,196
PO-PVC-050	1,719	2,875	8,238
PO-RGC-050	2,092	3,607	12,452
PO-RVC-050	2,219	3,813	14,052
PO-KGF-051	2,002	3,661	16,310
PO-KHF-051	481	772	1,610
PO-DHC-052	257	389	755
PO-CGC-052	810	1,284	2,499
PO-MVC-052	2,274	3,916	14,779
PO-RGC-052	2,092	3,607	12,452
PO-RVC-052	2,219	3,813	14,052

shown as "> 20,000 km". In all cases, the maximum distance occurs during the lowest wind speed. With each increase in wind speed, as listed in Figure 6-1, the hazard distance decreased by approximately 28 to 64 percent depending on the Pasquill stability category.

6.3 Boundary Excursion.

a. To determine the probability of off-post excursions (Section 7.0), it is necessary to determine in what direction(s) the hazard distances exceed the TEAD South Area installation boundaries. The worksheet shown in Figure 6-2 was used to facilitate the comparison of hazard distances resulting from each scenario to the South Area boundary distances shown in Table 4-1/Figure 4-4.

b. Of the 26 FPEIS Credible Catastrophic Accident scenarios listed in Table 5-2, only 21 have the potential to create hazard distances which exceed the TEAD South Area installation boundary. The completed worksheets (Figure 6-2) for each scenario, showing under what conditions (wind direction, Pasquill stability and wind speed) each hazard distance exceeds the depot boundary, are included in Section Two of Appendix E.

(1) No off-post hazard distances were created by Mustard filled munitions or ton containers, and except for scenario PO-CGC-042, no off-post hazard distances were created by GB filled cartridges. The specific FPEIS Credible Catastrophic Accident scenarios which did not result in off-post hazard distances were PO-KHC-042, PO-CGC-049, PO-CGC-050, PO-KHF-051 and PO-

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 236-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: ____________

AGENT: ____________

AMOUNT: ____________ lbs

MODE: ____________

DURATION: ____________ min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
2.57																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
2.57																

Figure 6-2: TEAD South Area Boundary Distance Worksheet

CGC-052.

(2) No Deaths hazard distances exceeded the installation boundary under Pasquill stability category F for each of the 21 scenarios, however only 15 of the 21 scenarios resulted in off-post excursions under Pasquill stability category E. GB and VX filled M55 rockets and bulk items dominated the 15 scenarios. The six scenarios which did not create off-post ND hazard distances under Pasquill stability category E were PO-CGC-042, PO-PGC-042, PO-PGC-049, PO-PVC-049, PO-PGC-050 and PO-PVC-050 which involve GB-filled cartridges, GB-filled projectiles and VX-filled projectiles.

(3) Only three scenarios, PO-AGC-041, PO-KVC-042 and PO-SVC-042, result in off-post excursions during Pasquill stability category D. However, off-post excursions resulting from these scenarios <u>can not</u> be prevented by simply limiting disposal plant operations to daylight hours since Pasquill stability category D occurs 24-hours per day (Figure 4-6). To ensure these scenarios do not create off-post hazards, operations would have to be further limited to when the wind was equal to or greater than 3.1 knots (1.6 meters per second) or to when the net radiation index is equal to or greater than 2 (see Table 4-3). The later condition occurs when the solar altitude is at least 15^{o} and the cloud cover is less than or equal to 50%.

REFERENCES

1. Personnel Computer Program for Chemical Hazard Prediction, 1987, CRDEC-TR-87021, Chemical Research, Development and Engineering Center.

2. Risk Analysis in Support of the Chemical Stockpile Disposal Program, December 1987, SAPEO-CDE-IS-87014, Program Executive Officer-Program Manager for Chemical Demilitarization.

7.0 **Off-Post Excursion Probability Determination**.

The probability of an off-post excursion is a function of the probability of the event occurring and the total of the frequency of the meteorological conditions which cause/permit the resulting chemical agent cloud to travel beyond the installation boundary. The probabilities of the non-M55 rocket FPEIS Credible Catastrophic Accident scenarios are classified SECRET because an individual could calculate the amount of chemical agent/munitions in the U.S. stockpile given the accident frequencies contained in previously published reports. Therefore the probability of the off-post excursions based on the non-M55 rocket FPEIS Credible Catastrophic Accident scenarios are also classified. As a result, the majority of the numerical data and results for this section are presented only in Appendix C/Volume II.

7.1 Frequency of Meteorological Conditions.

a. The annual frequency of each meteorological condition which would permit an off-post excursion is the product of the annual frequencies of the corresponding Pasquill stability category, wind speed and direction, season, and mixing layer height. In addition, because this study is evaluating the advisability of operating the TEAD CSDP disposal facility on a 24-hour basis, the frequency of the meteorological condition is also dependent on the frequency of daytime and nighttime conditions. Equation (1) illustrates this relationship.

$$F_{wind} \times F_{stability} \times F_{season} \times (\text{Day/Night}) = F_{met} \quad (1)$$

where: F_{wind} - is the annual average frequency of the wind for the selected direction, speed and Pasquill stability category. The values are listed in Tables D-5, D-6 and D-7.

$F_{stability}$ - is the annual average frequency for the selected Pasquill stability category (D, E or F). The values are listed in Table 4-3 as well as Tables D-5, D-6 and D-7.

F_{season} - is the annual season frequency. In D2PC, the mixing layer height is determined by the season. Because the lowest seasonal mixing layer height from Table 4-5 was used on an annual basis, F_{season} equals one.

Day/Night - is the percent occurrence of the selected Pasquill Stability Category during daytime or nighttime. The diurnal distribution of Pasquill stability categories D, E, and F are listed in Table 7-1. The mean values from Table 7-1 were used in frequency calculations.

F_{met_i} - is the daytime or nighttime frequency for the individual meteorological condition which would permit an off-post excursion.

b. For each Pasquill stability category, there are a minimum of 32 values for F_{wind}, based on wind speed and direction (see Tables D-5 through D-7). In addition, meteorological conditions which permit off post excursions exist under two (E and F) and sometimes three (D, E and F) Pasquill stability categories. Therefore the total frequency of meteorological conditions which

Table 7-1: Diurnal Distribution of Pasquill Stability Categories; TEAD South Area (Percent Occurrence)

MONTH	PASQUILL STABILITY CATEGORY					
	****** D ********		******* E ********		******* F *******	
	DAYTIME	NIGHTTIME	DAYTIME	NIGHTTIME	DAYTIME	NIGHTTIME
JANUARY	58.15	41.85	23.38	76.62	6.09	93.91
FEBRUARY	45.39	54.61	17.69	82.31	7.75	92.25
MARCH	53.45	46.55	13.08	86.92	1.46	98.54
APRIL	51.99	48.01	15.04	84.96	3.25	96.75
MAY	60.62	39.38	21.88	78.13	11.83	88.17
JUNE	56.00	44.00	17.92	82.08	10.00	90.00
JULY	64.31	35.69	18.33	81.67	9.01	90.99
AUGUST	63.68	36.32	24.29	75.71	9.66	90.34
SEPTEMBER	55.97	44.03	18.25	81.75	10.19	89.81
OCTOBER	50.37	49.63	20.00	80.00	7.60	92.40
NOVEMBER	49.02	50.98	13.73	86.27	5.05	94.95
DECEMBER	42.63	57.37	15.44	84.56	8.57	91.43
MEAN	54.38	45.62	18.28	81.72	7.54	92.46
MAXIMUM	64.31	57.37	24.29	86.92	11.83	98.54
MINIMUM	42.63	35.69	13.08	75.71	1.46	88.17

would permit off post excursions is defined by the following equation:

$$\Sigma(\Sigma(F_{wind}) \times F_{stability} \times F_{season} \times (Day/Night)) = F_{met_{total}} \qquad (2)$$

where $\Sigma(F_{wind})$ - is the sum of the wind frequencies for each

Pasquill stability category.

$\Sigma(\ldots)$ - is the sum of the total frequencies of each Pasquill stability category.

and $F_{met_{total}}$ - is the total frequency of all meteorological conditions which would permit an off-post excursion.

c. Table 7-2 lists the total frequencies for the meteorological conditions which would result in ND hazard distance off-post excursions. The detailed spreadsheet showing the individual frequencies for each Pasquill stability category is at Section 3 of Appendix E. A third category, "Limited Daytime", is listed in Table 7-2 which represents the minimum off-post excursion frequency which can be achieved for a given scenario; under "Limited Daytime", only the frequency of off-post excursion(s) occurring under Pasquill stability category "D" are listed. The concept of "Limited Daytime" will be discussed in more detail in Section Eight.

d. As expected, the frequency of meteorological conditions which permit off-post excursions is significantly greater at nighttime than during daytime. The ten-fold increase in off-post excursions reflects that only a small percentage of daytime hours (two hours after sunrise[1] and an hour before sunset) can exist under Pasquill stability categories "E" or "F".

---

[1] As described in paragraph 4.2.c(4), the conservatism of the CRSTER model causes stable atmospheric conditions to exist two hours after sunrise instead of one hour as established by Dr. Pasquill.

Table 7-2: Total Meteorological Frequency of No Deaths Off-Post (TEAD) Excursions

SCENARIO ID NUMBER	TOTAL FREQUENCY		
	DAYTIME	LIMITED DAYTIME	NIGHTTIME
PO-AGC-041	0.0610	0.0189	0.3198
PO-BGC-042	0.0162	0.0000	0.1858
PO-CGC-042	0.0019	0.0000	0.0235
PO-KGC-042	0.0221	0.0000	0.2148
PO-KVC-042	0.0600	0.0179	0.3189
PO-PGC-042	0.0145	0.0000	0.1776
PO-SVC-042	0.0593	0.0179	0.3159
PO-KGF-045	0.0221	0.0000	0.2148
PO-PGC-049	0.0145	0.0000	0.1776
PO-PVC-049	0.0145	0.0000	0.1784
PO-QGC-049	0.0196	0.0000	0.2036
PO-RGC-049	0.0191	0.0000	0.1993
PO-RVC-049	0.0191	0.0000	0.1996
PO-PGC-050	0.0145	0.0000	0.1776
PO-PVC-050	0.0145	0.0000	0.1784
PO-RGC-050	0.0191	0.0000	0.1993
PO-RVC-050	0.0191	0.0000	0.1996
PO-KGF-051	0.0190	0.0000	0.1983
PO-MVC-052	0.0191	0.0000	0.1996
PO-RGC-052	0.0191	0.0000	0.1993
PO-RVC-052	0.0191	0.0000	0.1996

7.2 Off-Post Excursion Probability

a. The probability of an off-post excursion is the product of the total frequency of the meteorological conditions which permit the hazard distance to

exceed the installation boundary (Table 7-2) multiplied by the probability of the accident scenario occurring. Table 7-3 shows the 11 FPEIS Credible Catastrophic Accident scenarios which still meet the criteria of a Credible Catastrophic Accident after the accident probability has been multiplied by the total frequency of the meteorological conditions which permit off-post excursions. The probabilities for the scenarios are listed in Table C-3 (Volume II). Fifty-five percent of these scenarios involve GB and VX filled M55 rockets with the balance being divided between GB filled ton containers (9%), GB and VX filled 155mm projectiles (18%), land mines (9%) and spray tanks (9%).

b. Although the distribution of Credible Catastrophic Accidents in Table 7-3 occurs fairly equally between daytime and nighttime, the distribution is dependent on the agent/munition and scenario involved. The four scenarios which do not result in daytime Credible Catastrophic Accidents involve bulk items (semi-continuous release from GB filled ton containers and VX filled spray tanks) and two out-of-the three scenarios involving a detonating VX filled M55 rocket. All seven scenarios which can cause daytime Credible Catastrophic Accidents involve a detonation of a munition (scenarios 49, 50 and 52) and predominately involve GB filled M55 rockets (43%) and GB and VX filled 155mm projectiles (29%).

c. Although seven of the 11 scenarios can result in daytime Credible Catastrophic Accidents, **no Credible Catastrophic Accidents occur during "Limited Daytime"** (daytime hours excluding stable atmospheric conditions). Therefore it is technically feasible to eliminate internally initiated

Table 7-3: TEAD Site Specific Credible Catastrophic Accidents

SCENARIO ID NUMBER	NO DEATHS HAZARD DISTANCE OFF POST EXCURSIONS WITH PROBABILITY ≥ 10E-8			
	24 HOUR	DAYTIME	LIMITED DAYTIME	NIGHTTIME
PO-KGC-042	X	- -	- -	X
PO-SVC-042	X	- -	- -	X
PO-PGC-049	X	X	- -	X
PO-PVC-049	X	X	- -	X
PO-RGC-049	X	X	- -	X
PO-RVC-049	X	- -	- -	X
PO-RGC-050	X	X	- -	X
PO-RVC-050	X	- -	- -	X
PO-MVC-052	X	X	- -	X
PO-RGC-052	X	X	- -	X
PO-RVC-052	X	X	- -	X

credible catastrophic disposal accidents by restricting disposal facility operations to the portion of the day when Pasquill stability categories E or F do not occur.

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8.0 Risk Comparison

a. Although the analysis performed in Section 7.0 indicated that it was possible to eliminate off post excursions resulting from internally initiated disposal facility Credible Catastrophic Accident scenarios by restricting operations to the portion of the day when Pasquill categories "E" and "F" do not exist, this approach does not address the more relevant concern of which operating scenario results in the **lowest total risk to the public**. This is because the analysis in Section 7.0 only examined the scenarios which were dependent on CSDP disposal facility operations and did not take into account the risks associated with the other activates associated with on-site disposal of the TEAD chemical stockpile.

b. To determine which mode of CSDP disposal facility operations presents the lowest risk to the public three operating scenarios will be evaluated: restricted operations, unrestricted operations and partially restricted operations based on the results from Chapter 7. The total programmatic risk for each operating scenario will be determined based on the contributions from depot storage, handling and transportation, and disposal operations. Except for use in developing the partially restricted schedule, the results from Section Seven are not used in evaluating the total risk associated with the three operating scenarios. This is necessary to ensure the risks associated with disposal are treated on the same basis as the risks associated with storage and handling and transportation.

8.1 On-Site Disposal Alternative

a. The onsite disposal alternative encompasses three activates, each with their own associated risks: Depot Storage (also referred to as continued storage); Intra-depot Handling and Transportation; and Disposal Operations. Up to this point, this study has only addressed the internally initiated or process dependent scenarios.

(1) **Depot Storage** involves risks associated with storing and maintaining the chemical munitions in the existing facilities (igloos, warehouses and open storage in Area 10). The majority of the accident scenarios for depot storage are externally initiated by earthquakes, meteor strikes, plane crashes and other events which the storage personnel have little or no control over. Although the probability of these accidents is very small, the potential lethalities can be very large because of the quantity of chemical agent/munitions involved.

(2) **Handling and Transport** involve all the activates associated with removing the munitions from their storage locations and placing them in the On-Site Container (ONC), ground convoy from the storage area (Area 10) to the disposal facility, and handling the munitions at the disposal facility prior to disposal. The majority of these accident scenarios are internally initiated involving vehicle accidents or dropped munitions.

(3) **Disposal** includes all the operations and activates associated with disassembly, draining and incineration of the chemical agent and

munition. The accident scenarios are divided fairly evenly between internally initiated (process dependent) scenarios and externally initiated scenarios.

b. The two type of accident scenarios, externally and internally initiated, present different risks to the public. Internally initiated scenarios are based on the number of items/munitions and present a finite risk to the public, that is, the risk is not time dependent and remains fairly constant until the items are eliminated. Externally initiated events however, are primarily time dependent since they are initiated by events which the operating personnel have no control over. The public risk from externally initiated scenarios increases with time. The longer the items exist, the greater the risk to the public.

8.2 Disposal Schedule Options

a. Figure 8-1 illustrates the three schedule options evaluated. Disposal operations begin 1 December 1992 and continue on a 5-day a week basis in accordance with the sequence shown in Table 8-1. The worksheet used to determine the total amount of time in hours to dispose of each munition is shown in Figure C-1. While it was attempted to adhere to the current scheduling philosophy/methodology, the schedules should be only viewed as representative of the duration of each option. For comparing the programmatic risks, the differences between the different option durations is more important than the actual duration of the options themselves.

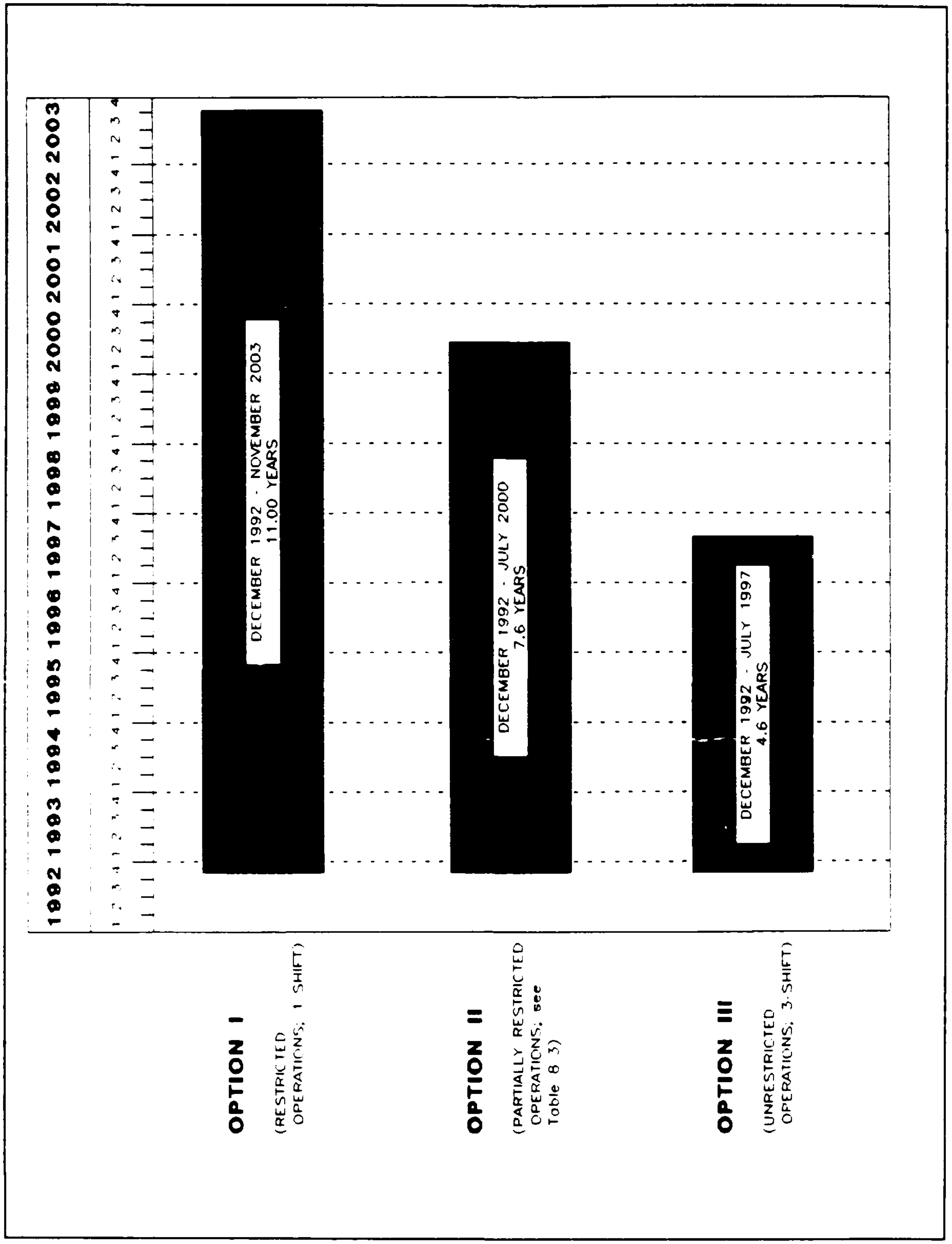

Figure 8-1: Meteorologically Restricted TEAD Stockpile Disposal Options

Table 8-1: TEAD Stockpile Disposal Sequence and Processing Rates

Munition Type	Average Processing Rates (munitions/hour) Ramp	Disposal	Changeover Time (weeks)
M55 GB Rockets	N/A	32.00	3
M55 VX Rockets	N/A	32.00	6
M121A1 VX 155mm Projo	51.25	102.50	2
M426 VX 8-in Projo	20.50	41.00	3
M426 GB 8-in Projo	N/A	41.00	2
M360 GB 105mm Cart	93.00	186.00	2
M122 GB 155mm Projo	51.50	103.00	0
M121A1 GB 155mm Projo	N/A	103.00	4
M2A1 HT 4.2-in Mortar	87.50	175.00	2
M110 H 155mm Projo	69.50	139.00	0
M104 HD 155MM Projo	N/A	139.00	3
Ton Container - HD	0.60	1.20	6
M23 VX Land mines	29.50	59.00	6
TMU-28/B VX Spray Tank	0.39	0.77	2
Ton Container -VX	0.38	0.75	3
Ton Container - GB	N/A	1.00	2
Mk116 "Weteye" GB Bombs	1.05	2.10	2
MC-1 GB Bomb	3.25	6.5	0

(1) OPTION I is the restricted operating scenario and is synonymous with one-shift operations.

(a) All disposal operations are performed during "Limited Daytime" which is the daylight hours when the atmospheric stability is neutral or lapse (Pasquill stability categories A-D). No operations would be performed when stable atmospheric conditions (Pasquill stability categories E and F) could exist. Based on the results from Section Six, only three

internally initiated disposal accidents could result in off-post excursions: PO-AGC-041, PO-KVC-042 and PO-SVC-042; however, as shown in Section Seven, the probability of an off-post excursion from these scenarios will be less than 10^{-8} (0.00000001).

(b) Because of the seasonal changes in sunrise and sunset, and consequently the changes in the occurrence of stable atmospheric conditions, the amount of hours available for disposal operations increases from a minimum of six hours in December to a maximum of 12 hours in June. Table 8-2 lists the operating periods for each month based on the Limited Daytime criteria. Note that the feasibility of operating a disposal facility on the schedule proposed in Table 8-2 is dubious at best, however, it represents the maximum time available for disposal operations while avoiding stable atmospheric conditions.

(2) OPTION II is the partially restricted operating scenario and represents the operating scenario of interest to the Department of Health and Human Services and the state of Utah. In Option II, all disposal operations which could result in off post excursions from the TEAD internally initiated Credible Catastrophic Accidents (Table 7-3) are restricted to Limited Daytime, all other disposal operations are performed 24-hours per day. Table 8-3 summarizes the disposal strategy for this option, the scenario ID numbers are the scenarios which could result in off post excursions.

(3) OPTION III is the unrestricted operating scenario and is synonymous with three shift disposal operations comparable to operating

Table 8-2: TEAD Restricted Operations Schedule ("Limited Daytime"; No Stable Meteorological Conditions)

MONTH	START OPERATION	STOP OPERATION	HOURS OF OPERATION
JANUARY	10:00	17:00	07:00
FEBRUARY	10:00	17:00	07:00
MARCH	10:00	18:00	08:00
APRIL	09:00	18:00	09:00
MAY	08:00	19:00	11:00
JUNE	08:00	20:00	12:00
JULY	08:00	19:00	11:00
AUGUST	08:00	19:00	11:00
SEPTEMBER	09:00	18:00	09:00
OCTOBER	09:00	17:00	08:00
NOVEMBER	10:00	17:00	07:00
DECEMBER	10:00	16:00	06:00

schedule proposed for the TEAD CSDP disposal facility.

b. The individual milestones used to develop the schedules are contained in Tables C-8 through C-10 (Volume II). Option I, as expected, is the longest schedule requiring 11 years to destroy the TEAD chemical

Table 8-3: OPTION II Disposal Strategy
(All scenarios with 10E-8 or greater probability of creating an off-post hazard restricted).

Munition	Operating Sequence Restricted	Unrestricted	Scenario(s)
M55 GB Rocket	X		49, 51, 52
M55 VX Rocket	X		49, 51, 52
M121A1 VX Projo	X		49
M426 VX		X	
M426 GB		X	
M360 GB		X	
M122 GB	X		49
M121A1 GB Projo	X		49
M2A1 HT Mortar		X	
M110 H		X	
M104 HD Mortar		X	
Ton Container - HD		X	
M23 VX Mine	X		52
TMU-28/b VX	X		42
Ton Container - VX	X		42
Ton Container - GB	X		42
Mk116 Bomb		X	
MC-1 Bomb		X	

stockpile, Option II required 7.8 years and Option III only required 4.6 years.

8.3 Total Disposal Risk Determination.

a. To determine the total risk of each schedule option to the public, it is necessary to determine the associated risk contribution of each activity (depot storage, handling and transportation, and disposal). For the

comparison to be valid, the measure of risk for each activity must be based on a common database (population distribution, meteorological conditions, etc.). Since it was beyond the scope and charter of this study to evaluate the site specific meteorological and geographical impacts on the hazard distances associated with the storage, and handling and transportation Credible Catastrophic Accident scenarios, the FPEIS risk values (based on expected human fatalities) will be used to determine the risk contribution from each activity (storage, handling and transportation, and disposal)[1]. (NOTE: Expected Lethality is the product of the probability of the accident/event occurring multiplied by the potential average lethalities)
The manipulation of the FPEIS risk values is described below.

a. Depot Storage. The risks from depot storage occur in two phases. Before disposal operations begin, the annual risk from storage is assumed to be constant, however the storage risk during disposal will decrease as the munition stockpile is destroyed. The actual rate of decrease is dependent on the agent and munition involved, however for use in this study, the storage risk during disposal is assumed to equal one-half the total storage risk for the same period of time. Equation three illustrates this relationship.

$$R_{prog} = \underbrace{((R_{annual}) \times (T_{delay}))}_{\text{* Before Disposal *}} + \underbrace{(1/2((R_{annual}) \times (T_{disposal}))}_{\text{* During Disposal *}} \qquad (3)$$

where: R_{annual} - the total annual risk for a given munition. Table 8-4 lists the FPEIS storage scenarios which have expected

lethalities greater than zero. The composite risk for each munition/agent listed in Table 8-4 are shown in Table C-4 (Volume II) and were derived from the values listed in Table C-1 (Volume II).

T_{delay} - the time delay in storage before the start of disposal operations. The values for T_{delay} are listed in Tables C-8 through C-10 (Volume II).

$T_{disposal}$ - the time required to destroy the item stockpile. The values for $T_{disposal}$ are listed in Tables C-8 through C-10 (Volume II).

and R_{prog} - the programmatic risk contribution for the specific munitions/agent.

b. **Handling and Transportation.**

(1) As described in paragraph 8.1.a(2), three types of activities are included in "Handling and Transportation": handling at the disposal facility, depot handling away from the disposal facility and transportation from the storage area to the disposal facility. The FPEIS handling and transportation accident scenarios with expected lethalities greater than zero are listed in Table 8-5. The composite risks are contained in Table C-5 and were derived from the values listed in Table C-2 (Volume II). (NOTE: the handling accident scenarios associated with munition transfer from the Munition Holding Igloo (MHI) to the Multipurpose Demil Building (MDB) have been eliminated. This was performed to take credit for the improved safety

Table 8-4 : FPEIS Continued (Depot) Storage and Handling Accident Scenarios (CS) With Expected Lethalities Greater Than Zero

Munition/ Agent	Scenario ID Number	Scenario Description
PG, QG, PV	HS-005	Drop of munition leads to detonation.
CG, PG, QG, PV	HS-007	Collision accident with prolonged fire.
PG, RG, MV, PV, RV	HS-011	Munition pallet dropped during pallet inspection; detonation occurs.
QG	SL-005	Large aircraft indirect crash onto storage area; fire not contained.
KG	SL-007	Severe earthquake breaches the munitions in storage igloos, no detonations.
KH, SV	SL-008	Meteorite strikes the storage area; fire occurs; munitions breached.
KH, SV	SL-015	Small aircraft direct crash onto open storage or warehouse, fire occurs, not contained in 30 minutes.
PG, QG, RG, MV, PV, QV, RV	SL-022	Severe earthquake leads to munition detonation.
PG, RG, MV, PV, RV	SL-025	Munition dropped during leaker isolation, munition detonates.
SV	SL-A27	Earthquake occurs, warehouse intact, munitions intact, fire occurs at <u>one</u> warehouse
SV	SL-B27	Earthquake occurs, warehouse intact, munitions intact, fire occurs at <u>two</u> warehouses.
SV	SL-C27	Earthquake occurs, one warehouse damaged, munitions intact, fire occurs at <u>one</u> warehouse.
SV	SL-D27	Earthquake occurs, one warehouse damaged, munitions intact, fire occurs at <u>two</u> warehouses.
SV	SL-E27	Earthquake occurs, two warehouses damaged, munitions intact, fire occurs at <u>one</u> warehouse.
SV	SL-F27	Earthquake occurs, two warehouses damaged, munitions intact, fire occurs at <u>two</u> warehouses.

Table 8-5: FPEIS Handling and Transportation Accident Scenarios (HT) With Expected Lethalities Greater Zero

Munition/ Agent	Scenario ID Number	Scenario Description
		HANDLING AT THE DISPOSAL FACILITY
PG, QG, RG, MV, PV, QV, RV	HF-012	Drop of bare single munition inside the Munitions Demilitarization Building (MDB) leads to detonation.
		ON-SITE HANDLING AWAY FROM THE DISPOSAL FACILITY
BG, KG	HO-005	Drop of Onsite Container (ONC)
KG, SV	HO-006	Forklift collision with short duration fire during handling of ONC.
BG, KG	HO-007	Forklift collision without fire during handling of ONC.
		ON-SITE TRANSPORTATION
KG	VO-001	A munition vehicle collision/overturn occurs and crush forces fail the agent containment.
KG	VO-003	A munition vehicle collision/overturn occurs and puncture forces fail the agent containment.
CG, PG, RG, MV, PV, RV	VO-004	A munition vehicle accident with fire occurs causing detonation of burstered munitions. Ignition of the propellant by a probe could also detonate the burster of a cartridge and the burster of a rocket could be detonated by impact-induced ignition of the rocket propellant.
RG	VO-012	A severe earthquake occurs causing a munitions vehicle accident and fire fails detonates burstered munitions.

associated with the Container Handling Building (CHB) which eliminates the need for the MHI.)

(2) Since depot handling and transportation will occur only during daylight hours regardless of the disposal facility operating schedule, the risks for these activities is assumed to occur equally for all schedule options. Disposal facility handling risks are treated in the same manner as internally initiated disposal risks described below.

c. Disposal Operations.

(1) Internally Initiated. The FPEIS internally initiated disposal accidents with expected lethalities greater than zero are listed in Table 8-7. Composite risks for each munition/agent listed in Table 8-6 are contained in Table C-6 and were derived from the values listed in Table C-2 (Volume II). Since accident scenarios PO-AGC-041, PO-KVC-042 or PO-SVC-042 are not listed in Table 8-6, the internally initiated disposal risks will be used only for those munitions processed on a unrestricted basis (24-hour/3-shift).

(2) Externally Initiated. Like the risks associated with depot storage, risks created by externally initiated disposal accidents are time dependent. As long as the munitions are present in the disposal facility, the risks are present. The accident scenarios with expected lethalities greater than zero are listed in Table 8-7. The annual composite risks for each agent munition listed in Table C-7 are not classified but are contained in

Table 8-6: FPEIS Internally Initiated Disposal Accident Scenarios (DI) With Expected Lethalities Greater Than Zero

Munition/ Agent	Scenario ID Number	Scenario Description
KG	PO-042	Metal Parts Furnace (MPF) explosion due to failure to stop fuel flow after a shutdown.
PG, RG, PV	PO-049	Munition detonation in Explosion Containment Room (ECR) causes structural and ventilation system failure.
RG	PO-050	Munition detonation in ECR causes structural failure, a fire and ventilation failure.
RG, MV, RV	PO-052	A burstered munition is fed to the Dunnage Incinerator (DUN)

Appendix C for completeness. The individual annual risks were calculated by multiplying the accident probabilities from Appendix I.1.4 of the GA Technologies risk study[2] by the average lethalities listed in "Consequence Estimates; Potential Fatality Estimates; Average Population Density" File CNSPO contained Volume Two of the MITRE Corporation risk analysis[3]. The sum of the individual annual risks for a specific munition/agent is the composite risk.

Table 8-7: FPEIS Externally Initiated Disposal Accident Scenarios (DE) With Expected Lethalities Greater Than Zero

Munition/ Agent	Scenario ID Number	Scenario Description
KG, KV, SV	PO-025	Earthquake damages the Munitions Demilitarization Building (MDB) structure, munitions fall and are punctured, fire suppressed.
BG, SV	PO-026	Earthquake damages the MDB structure; munitions fall and are punctured; earthquake also initiates fire; fire suppression system fails.
BG, CC, KG, PG, QG, RG, DH, KH, PH, MV, KV, PV, RV, SV	PO-029	Earthquake damages the MDB; munitions are intact; fire occurs; fire suppression system fails.
CG, PG, QG, RG, DH, PH, MV, PV, RV	PO-033	Earthquake causes munitions to fall but no detonation occurs; the MDB is intact; the Toxic Cubicle (TOX) is intact; earthquake also initiates fire; fire suppression fails.

8.4 Total Disposal Risk Comparison.

a. Table 8-8 summarizes how the risks associated with depot storage, handling and transportation, and disposal were used to determine the total risk for each schedule option. The risks associated with depot storage and externally initiated disposal accidents are applied equally to all three scenarios. The risks associated with handling and transportation and disposal are dependent on whether the munitions are processed at the disposal facility

Table 8-8: Applicability of Individual Activity Risks to the Total Disposal Risk

Source of Risk	Schedule Option		
	Option I (Restricted)	Option II (Partially Restricted)	Option III (Unrestricted)
CS	X	X	X
DI	- -	(1)	X
DE	X	X	X
HT	(2)	(3)	X

Notes:
(1) Only for those munitions processed on a unrestricted basis.
(2) Depot handling and transportation only.
(3) Depot handling and transportation plus disposal facility handling for munitions processed on a unrestricted basis.

CS - Depot/Continued Storage Accidents
HT - Handling and Transportation Accidents
DI - Internally Initiated Disposal Accidents
DE - Externally Initiated Disposal Accidents

on a restricted or unrestricted basis.

b. The programmatic risks for each schedule option are summarized in Table 8-9 with the detailed calculations shown in Figures C-2 through C-4. Figure 8-2 illustrates the relationship of the programmatic risks for each schedule option. Four things stand out clearly:

Table 8-9: Total and Major Activity Risks for TEAD CSDP Disposal Facility Operating Schedule Options

Risk	Schedule Options		
	Option I	Option II	Option III
Total	3.77×10^{-4}	2.53×10^{-4}	1.87×10^{-4}
CS	2.85×10^{-4}	1.68×10^{-4}	1.22×10^{-4}
DI	0	0	2.14×10^{-6}
DE	5.70×10^{-5}	4.39×10^{-5}	2.05×10^{-5}
HT	3.51×10^{-5}	4.06×10^{-5}	4.25×10^{-5}

Notes: CS - Depot/Continued Storage Accidents
HT - Handling and Transportation Accidents
DI - Internally Initiated Disposal Accidents
DE - Externally Initiated Disposal Accidents

Option I - Restricted Disposal Operations (1-Shift Operations)
Option II - Partially Restricted Disposal Operations
Option III - Unrestricted Disposal Operations (3-Shift Disposal Operations)

(1) The total risk to the public, regardless of which schedule option is selected, is <u>very small</u>.

(2) The total risks for the schedule options are essentially equal, having the same order of magnitude (10^{-4}). Although the total risk for Option III is only 49% of the total risk for Option I and 74% of the total

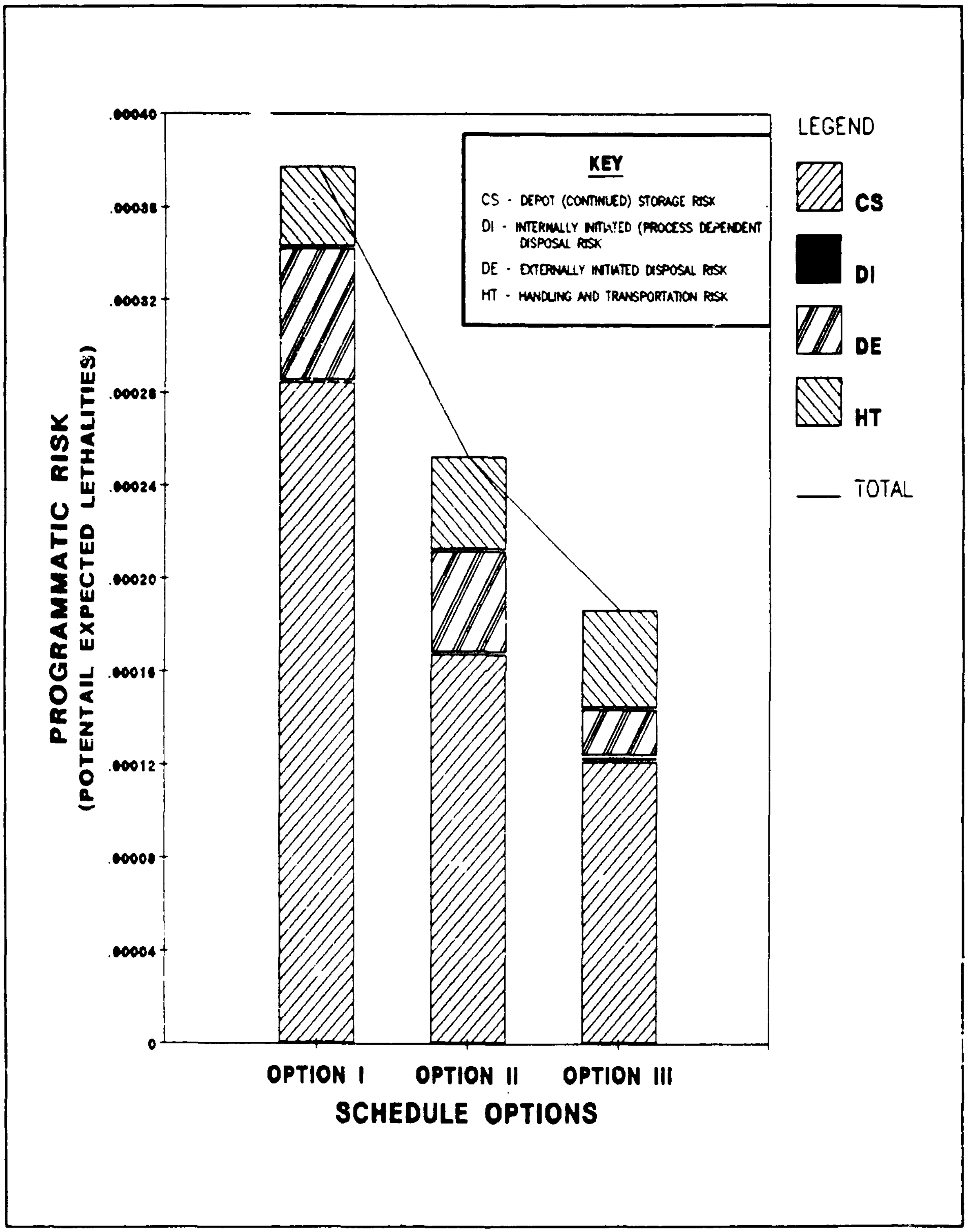

Figure 8-2: Comparison of Total Risks for TEAD On-Site Disposal Options

risk for Option II, the differences are within the accuracy of the calculations.

(3) **The risks associated with depot storage represent the predominate risk for each schedule option, with risks one to two orders of magnitude greater than the risks associated with the other activities. This is especially true for Option I where the depot storage risk alone is greater than the total risks for either Option II or Option III.**

(4) The risks associated with internally initiated disposal operations represent the least risk to the public.

c. Although restricted disposal operations eliminates the risks associated with the internally *initiated disposal accident scenarios*, this reduction is very small compared to the risks associated with the other activities associated with on-site disposal. The relationship of the major activity risks to the programmatic risks is illustrated in Figure 8-3, where even in Option III, **the internally initiated disposal risks only represent 1% of the total programmatic risks** as compared to 65% for depot storage, 23% for handling and transport and 11% for the externally initiated disposal risks.

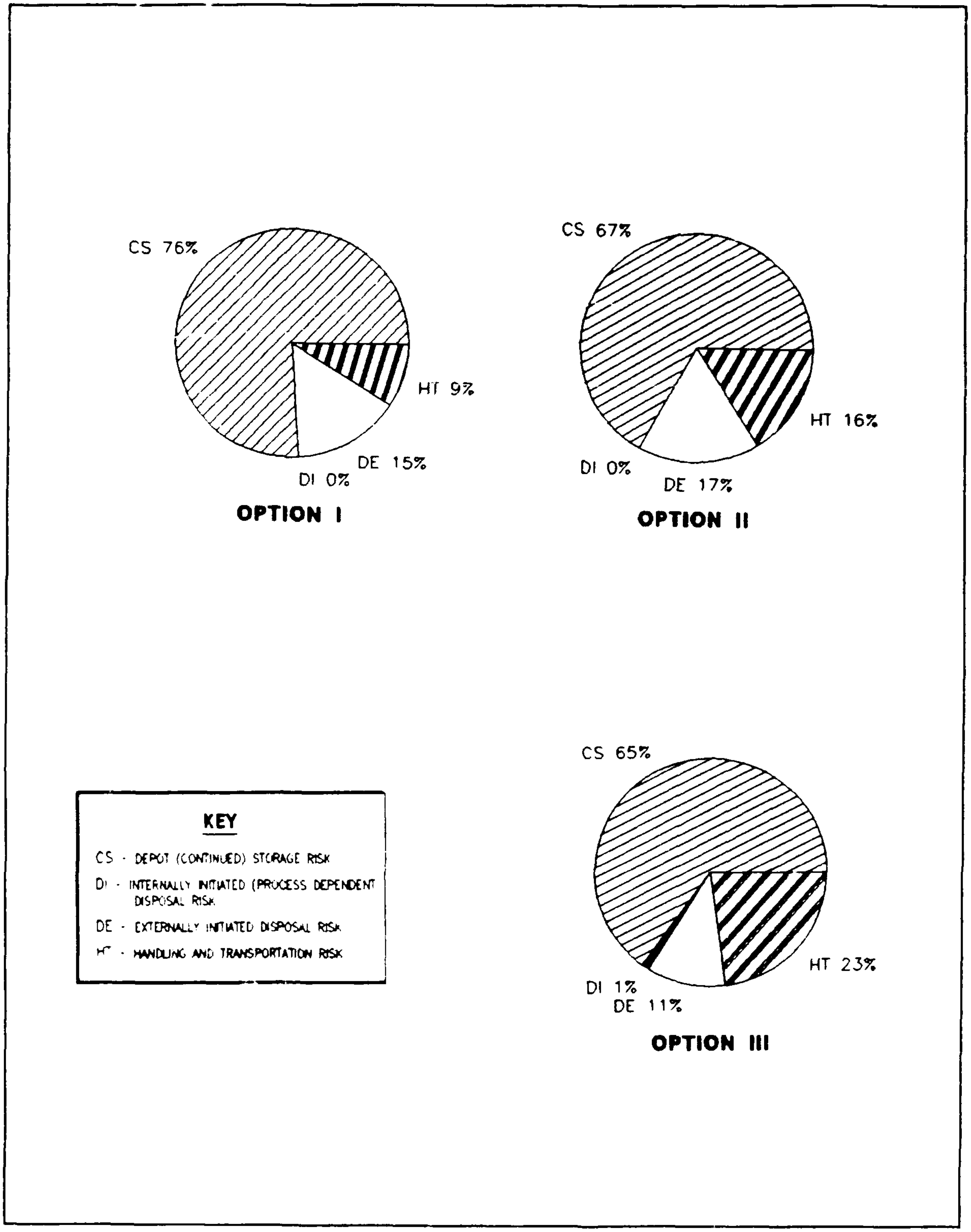

Figure 8-3: Relative Contributions to Total TEAD On-site Disposal Risk

REFERENCES

1. Risk Analysis in Support of the Chemical Stockpile Disposal Program, Volume Four, December 1987, SAPEO-CDE-IS-87014, Program Executive Officer-Program Manager for Chemical Demilitarization. (Classified SECRET)

2. Risk Analysis of the Onsite Disposal of Chemical Munitions, SAPEO-CDE-IS-87010, August 1987, Program Executive Officer-Program Manager for Chemical Demilitarization.

3. Risk Analysis in Support of the Chemical Stockpile Disposal Program, Volume Two - Consequence Data, December 1987, SAPEO-CDE-IS-87014, Program Executive Officer-Program Manager for Chemical Demilitarization

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9.0 Conclusions and Recommendations.

The purpose of this study was to examine the TEAD site specific meteorological, chronological and geographical effects on the hazard distances associated with the internally initiated (process dependent) disposal process Credible Catastrophic Accidents used in the CSDP Final Programmatic Environmental Impact Statement (FPEIS) and to determine which operating scenario represented the lowest total risk to the public.

9.1 Meteorological Effect on Accident Scenarios.

Of the 26 FPEIS internally initiated disposal Credible Catastrophic Accident scenarios, only 11 continue meet the definition of a Credible Catastrophic Accident (CCA) after TEAD site specific geographical and meteorological conditions are taken into account (i.e. 10^{-8} probability or greater of creating a downwind hazard distance which exceeded the installation boundary).

a. Five of the 15 non-CCA scenarios involve GB filled cartridges and Mustard filled ton containers which result in hazard distances less than the distance to the TEAD South Area installation boundary. The remaining ten non-CCA scenarios have off-post excursion probabilities of less than 10^{-8}.

b. The 11 CCA scenarios only exist under stable atmospheric conditions (Pasquill stability categories E and F), therefore it is possible to eliminate the CCA scenarios by restricting disposal facility operations to the portions

of the day when these conditions do not exist (i.e. from two hours after sunrise to one hours before sunset). It should be noted however, that **simply restricting disposal facility operations to non-stable meteorological conditions will not prevent off-post excursions** because three accident scenarios (PO-AGC-041, PO-KVC-042 AND PO-SVC-042) create off-post excursions during neutral atmospheric conditions (Pasquill stability category D) which can occur 24-hours per day, and it is these three scenarios which create the largest hazard distances under any atmospheric conditions. To ensure these scenarios do not create off-post hazards, operations would have to be further limited to when the wind was equal to or greater than 3.1 knots (1.6 meters per second) or to when the net radiation index is equal to or greater than 2. The later condition occurs when the solar altitude is at least 15^{o} and the cloud cover is less than or equal to 50%.

c. Although the impact can not be evaluated quantitatively, restricting disposal operations to less than 24-hours per day will have an adverse impact on the probability of an agent release. It is widely recognized that the safest portion of an automated process is when the equipment is operating automatically and operator involvement is minimized. This is true not only for nuclear power plants and commercial petro-chemical facilities but for chemical munition disposal facilities as well. By starting and stopping the disposal process each day, the potential of an agent release might be increased by a factor of five as compared to starting and stopping the process once a week as currently proposed.

9.2 Impact on Total Risk.

Although the risk to the public from internally initiated CCA scenarios can be mitigated by restricting disposal operations, the true measure of public safety is the total risk which the operation presents to the public. The total risk associated with on-site disposal is dependent on the risks from depot storage, munition handling and transportation, as well as disposal operations.

a. The total risk to the public from the disposal of the TEAD chemical stockpile is very small, with expected lethalities on the order of 10-4 (0.0001). Stated another way, one fatality can be expected every 10,000 times the TEAD stockpile is destroyed. Although the total risk from unrestricted operations was only 49% and 74% of the total risks for restricted and partially restricted operations respectively, the differences are within the accuracy of the calculations. The predominate risk for all three operating scenarios is the risk associated with depot storage which ranges from 65 to 76 percent of the total risk associated with disposal of the TEAD chemical stockpile.

b. Regardless of which operating scenario is considered, restricted, unrestricted or partially restricted, the internally initiated disposal accidents only represent **a maximum of one-percent of the total risk**. Therefore, focusing on mitigating internally initiated disposal accidents will produce the smallest decrease in the total risk to the public and depending on

the methods used (i.e. restricting operations) could actually increase the risk to the public.

c. Although the effects of shift work on the performance of the operators can not be quantified, a penalty factor of twice the risk is commonly assessed to multi-shift operations. Even if this penalty is assessed to the risks associated with internally initiated disposal accidents, the results of the study are unaffected.

9.3 Recommendations.

a. TEAD CSDP disposal facility operations should not be restricted on the basis of stable meteorological conditions. Not only would the duration of the disposal program be extended by 3.2 to 6.4 years, but there is no reduction in the total risk to the public by restricting or partially restricting disposal operations.

b. Evaluate optimizing the disposal schedule to accelerate the disposal of the munitions which present the greatest storage risk. The risks associated with chemical munition storage are significantly greater than the risks associated with any other disposal activity. Since the accidents associated with storage are predominately externally initiated, the sooner the munitions are destroyed, the smaller the risk to the public. Table 9-1 lists the munitions in descending order of storage risk.

Table 9-1: Munition Ranking in Terms of Storage Risk (Descending Risk)

Munition/Container	Agent Fill
Spray Tank	VX
155mm Projectile	GB
155mm Projectile	VX
105mm Cartridge	GB
Ton Container	GB
115mm Rocket	GB
115mm Rocket	VX
Land Mine	VX
Ton Container	HD
8-in Projectile	GB
8-in Projectile	VX

c. Evaluate limiting handling away from the disposal facility and/or transportation from the storage area to the disposal facility to the portion of the day when stable meteorological conditions do not exist. However, this restriction should only be implemented if the additional loss of two to three hours per day does not impede disposal operations (i.e. extend the duration of the disposal program), otherwise any reduction realized by restricting handling and transportation activities could be offset by increases in the depot storage risk. In any event, unless significant reductions in the risk

associated with depot storage are realized, the resulting 23% reduction in the total risk created by restricting handling and transportation activities will be insufficient to affect the magnitude (i.e. 10^{-4}) of the total risk.

APPENDIX A

ABBREVIATIONS and ACRONYMS

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A	Strong Lapse Condition (Pasquill Stability Category)
B	Medium Lapse Condition (Pasquill Stability Category)
B	Bombs (Table 5-1)
C	Mild Lapse Condition (Pasquill Stability Category)
C	Cartridge (Table 5-1)
C	Centigrade
CAMDS	Chemical Agent Munitions Disposal System
CCA	Credible Catastrophic Accident
CHB	Container Handling Building
cm	Centimeters
CML	Conservative Most Likely
CSDP	Chemical Stockpile Disposal Program
D	Neutral Condition (Pasquill Stability Condition)
D	Mortar (Table 5-1)
DHHS	Department of Health and Human Services
E	Medium Inversion Condition (Pasquill Stability Condition)
F	Strong Inversion Condition (Pasquill Stability Condition)
F	Fire (Table 5-1_
F	Fahrenheit
FPEIS	Final Programmatic Environmental Impact Statement
G	GB (Table 5-1)
GB	Sarin; Nerve Agent
H/HD/HT	Mustard; Blister Agent
HF	Handling at the Disposal Facility
Hg	Mercury

HO	Handling Away From the Disposal Facility
HS	Handling During Depot Storage
K	Ton Container (Table 5-1)
M	Mine (Table 5-1)
m^3	Cubic Meters
MDB	Munitions Demilitarization Building
mg	Milligram(s)
min	Minute(s)
mm	Millimeter(s)
ND	No Deaths
ONC	Onsite Container
P	Projectile (Table 5-1)
PO	Plant Operations
Q	8-inch Projectile (Table 5-1)
R	M55 Rocket (Table 5-1)
RCRA	Resource COnservation Recovery Act
S	Spray Tank (Table 5-1)
sec	Second(s)
SL	Long Term (Depot) Storage
TEAD	Tooele Army Depot
V	VX
VO	Onsite Transportation Associated With Onsite Disposal
VX	Nerve Agent
WC	Worst Case
W	Warehouse Storage

APPENDIX B

CHEMICAL AGENTS AND MUNITIONS

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SECTION B-1

CHEMICAL MUNITION AND CONTAINER FACT SHEETS

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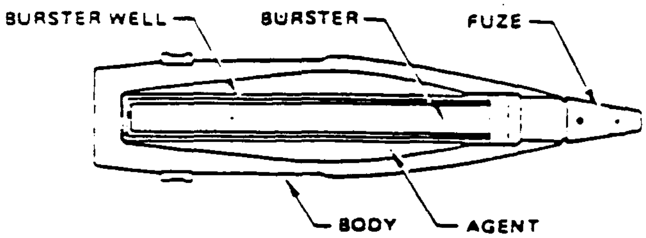
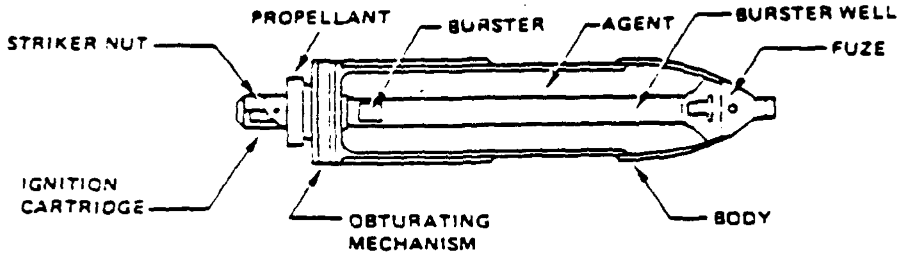


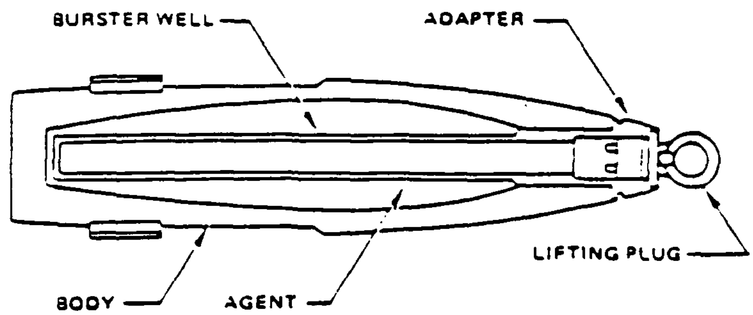
	Cartridge M360/GB	Cartridge M60/HD	Projectile M360/GB
LENGTH	31.1 in	31.1 in	31.1 in
DIAMETER	105 mm	105 mm	105 mm
TOTAL WT	43.86 lb	42.92 lb	N/A
AGENT	GB	HD	GB
AGENT WT	1.63 lb	2.97 lb	1.63 lb
FUZE	M508,M557	M51A5	--
BURSTER	M40, M40A	M5	--
EXPLOSIVE	Tetrytol, Comp B	Tetrytol	--
EXPLOSIVE WT	1.12 lb	0.3 lb	--
PROPELLANT	M67	M67	--
PROPELLANT WT	2.83 lb	2.83 lb	--
PRIMER	M28B2	M28B2, M28A2	--
PACKAGING	1 round/fiber container, 2 container/ wooden box	1 round/fiber container, 2 container/ wooden box	1 round/fiber container, 2 container/ wooden box

CARTRIDGE, 105 mm HOWITZER, M360, GB
CARTRIDGE, 105 mm HOWITZER, M60, HD
PROJECTILE, 105 mm HOWITZER, M360, GB



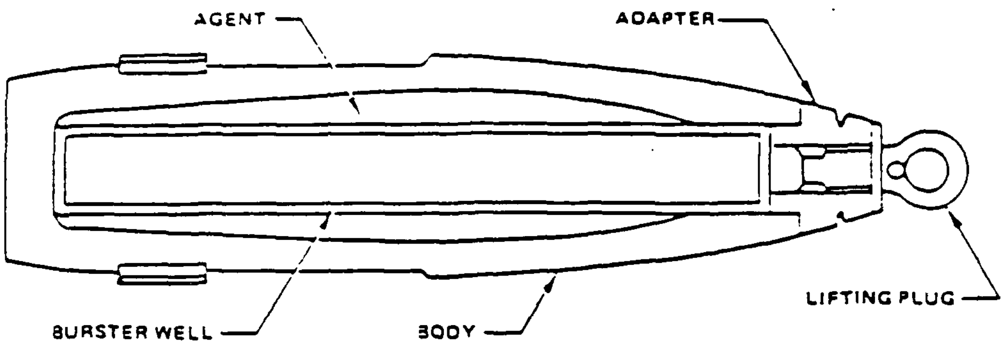
LENGTH	21.0 in	21.0 in
DIAMETER	4.2 in	4.2 in
TOTAL WT	24.67 lb	24.67 in
AGENT	HD	HT
AGENT WT	6.0	5.8
FUZE	M8, M51A5	M8
BURSTER	M14	M14
EXPLOSIVE	Tetryl	Tetryl
EXPLOSIVE WT	.14 lb	.14 lb
PROPELLANT	M6	M6
PROPELLANT WT	.6 lb	.4 lb
PRIMER	M28A2	M2
PACKAGING	1 round fiber/ container, 2 containers/ wooden box	1 round fiber/ container, 2 containers/ wooden box

CARTRIDGE, 4.2 INCH MORTAR, M2/M2A1, HT/HD



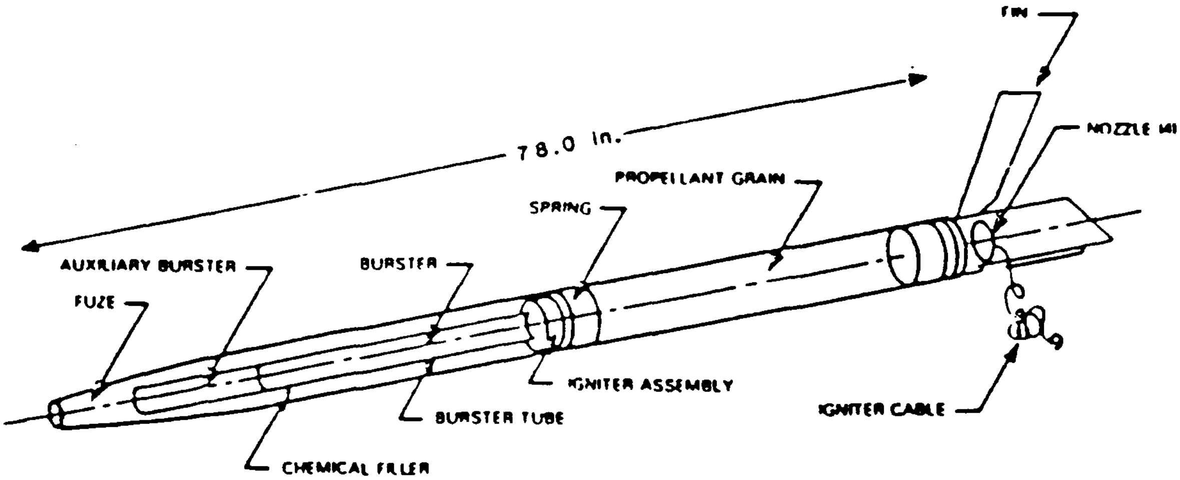
	M121	M121A1	M104	M110	M122
LENGTH	26.9 in	26.9 in	26.9 in	26.9 in	26.9 in
DIAMETER	155 mm	155 mm	155 mm	155 mm	155 mm
TOTAL WT	98.9 lb	98.9 lb	98.9 lb	98.9 lb	98.9 lb
AGENT	GB	VX, GB	H	H	GB
AGENT WT	6.0 lb	6.0 lb	11.7 lb	11.7 lb	6.5 lb
FUZE	None	None	None	None	None
BURSTER	M71	M71	M6	M6	M37
EXPLOSIVE	Comp B	Comp B	Tetrytol	Tetrytol	Tetrytol
EXPLOSIVE WT	2.45 lb	2.45 lb	.41 lb	.41 lb	2.45 lb
SUPPL CHG EXP	TNT	TNT	--	--	--
EXPLOSIVE WT	0.3 lb	0.3 lb	--	--	--
PROPELLANT	None	None	None	None	None
PROPELLANT WT	None	None	None	None	None
PRIMER	None	None	None	None	None
PACKAGING	8 Rounds/ wooden pallet	8 Rounds/ wooden pallet	8 Rounds wooden pallet	8 Rounds wooden pallet	8 Rounds wooden pallet

PROJECTILE, 155 mm HOWITZER, M121A1, GB OR VX
PROJECTILE, 155 mm HOWITZER, M121, GB or VX
PROJECTILE, 155 mm HOWITZER, M104, H
PROJECTILE, 155 mm HOWITZER, M110, H
PROJECTILE, 155 mm HOWITZER, M122, GB



LENGTH	35.1 in
DIAMETER	8 in
TOTAL WT	203 lb
AGENT	GB, VX
AGENT WT	14.5 lb
FUZE	None
BURSTER	M83
EXPLOSIVE	Comp B4
EXPLOSIVE WT	7 lb
SUPPL CHG EXP	TNT
EXPLOSIVE WT	0.3 lb
PROPELLANT	None
PROPELLANT WT	N/A
PRIMER	None
PACKAGING	6 Rounds/ wooden pallet

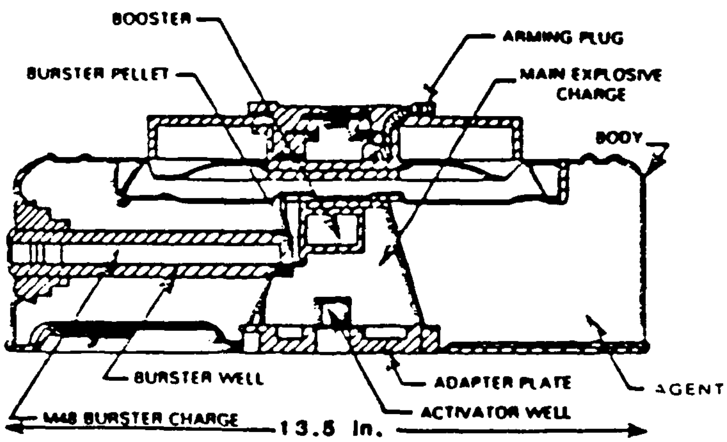
PROJECTILE, 8-INCH HOWITZER, M426, GB
PROJECTILE, 8-INCH HOWITZER, M426, VX



LENGTH	78.0 in	
DIAMETER	115 mm	
TOTAL WT	57 lb	56 lb
AGENT	GB	VX
AGENT WT	10.7 lb	10.2 lb
FUZE	M417	
BURSTER	M34, M36	
EXPLOSIVE	Comp B	
EXPLOSIVE WT	3.2 lb	
PROPELLANT	M28	
PROPELLANT WT	19.3	
PRIMER	M62	
PACKAGING	15 Rounds/ wooden pallet	

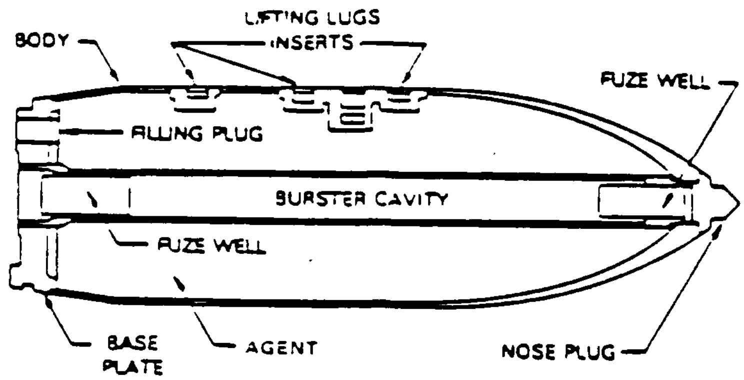
ROCKET, 115 mm, M55, GB

ROCKET, 115 mm, M55, VX



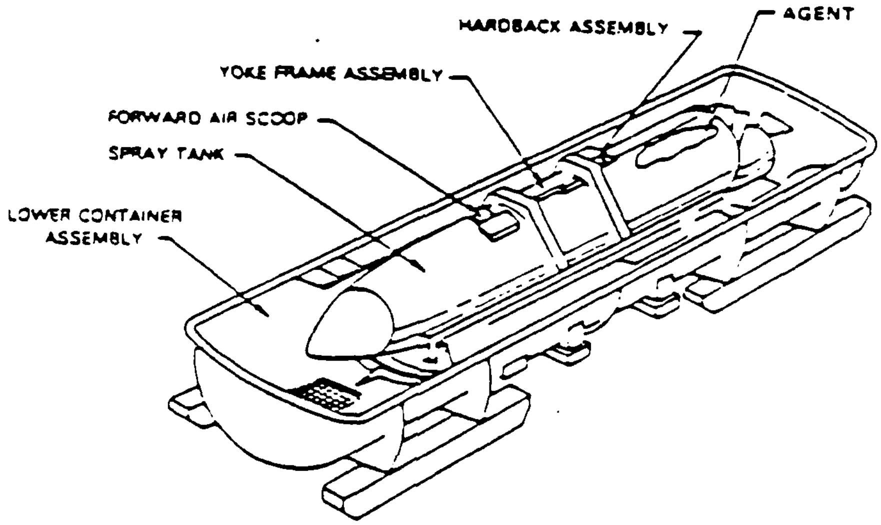
HEIGHT	5 in
DIAMETER	13.5 in
TOTAL WT	23 lb
AGENT	VX
AGENT WT	10.5 lb
FUZE	M603
BURSTER	M38
EXPLOSIVE	Comp B4
EXPLOSIVE WT	.8 lb
PROPELLANT	None
PROPELLANT WT	N/A
PRIMER	N/A
PACKAGING	3 Mines/ steel drum

MINE, VX, M23



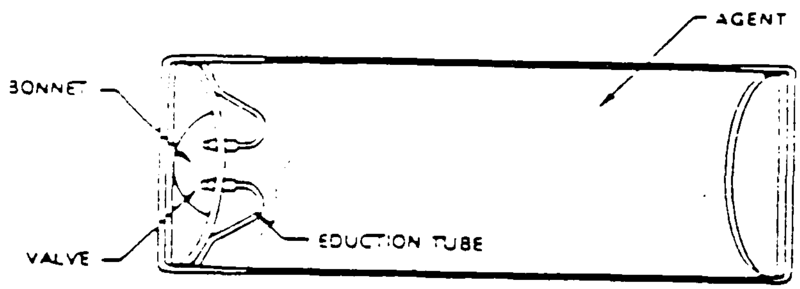
	MC-1	MK-116-0	MK-94
LENGTH	50 in	86 in	60 in
DIAMETER	16 in	14 in	10.8 in
TOTAL WT	725 lb (approx)	525 lb	441 lb (approx)
AGENT	GB	GB	GB
AGENT WT	220 lb	347 lb	108 lb
FUZE	None	None	None
BURSTER	None	None	None
EXPLOSIVE	None	None	None
EXPLOSIVE WT	N/A	N/A	N/A
PROPELLANT	None	None	None
PROPELLANT WT	N/A	N/A	N/A
PRIMER	None	None	None
PACKAGING	2 Bombs/wooden pallet	1 Bomb/metal container	1 Bomb/metal container

BOMB, 750 lb, MC-1, GB
BOMB, 525 lb, MK-116-0, GB
BOMB, 500 lb, MK-94, GB



LENGTH	185 in
DIAMETER	22.5 in
TOTAL WT	1,935 lb
AGENT	VX
AGENT WT	1,356 lb
FUZE	None
BURSTER	None
EXPLOSIVE	None
EXPLOSIVE WT	N/A
PROPELLANT	None
PROPELLANT WT	N/A
PRIMER	None
PACKAGING	1 tank/steel container

TANK, SPRAY, TMU-28/B, VX



	HT	H	HD	GA	GB	L	VX
LENGTH	81.5 in	81.5 in	81.5 in	81.5 in	81.5 in	81.5 in	81.5 in
DIAMETER	31.1 in	31.1 in	31.1 in	31.1 in	31.1 in	31.1 in	31.1 in
TOTAL WT	3,100 lb	3,100 lb	3,100 lb	N/A	2,900 lb	3,100 lb	3,000 lb
AGENT	HT	H	HD	GA	GB	L	VX
AGENT WT	1,700 lb	1,700 lb	1,700 lb	N/A	1,500 lb	1,700 lb	1,600 lb
FUZE	None	None	None	None	None	None	None
BURSTER	None	None	None	None	None	None	None
EXPLOSIVE	None	None	None	None	None	None	None
EXPLOSIVE WT	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PROPELLANT	None	None	None	None	None	None	None
PROPELLANT WT	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PRIMER	None	None	None	None	None	None	None
PACKAGING	None	None	None	None	None	None	None

TON CONTAINER, HT, H, HD, GA, GB, L, VX

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SECTION B-2

CHEMICAL MUNITION ENERGETIC MATERIAL

(PROPELLANT AND EXPLOSIVES)

FACT SHEETS

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TABLE B-1. ENERGETIC COMPONENTS OF CHEMICAL MUNITIONS

Munition	Component	Weight, gr	Composition
M55 Rocket	1. Fuze, M417		
	a. Booster Lead Charge	1.12	RDX
	b. Pellet Booster	183.5	RDX
	c. Rotor, Lead	2.77	RDX
	a. Detonator, M63		
	(1) Upper Charge Primer Mix	0.31	Overall Mixture: 40% Lead Styphnate 20% Lead Azide 20% Barium Nitrate 15% Antimony Sulfide 5% Tetracene
	(2) Intermediate Charge	2.0	Lead Azide
	(3) Lower Charge	0.99	RDX
	2. Squib, M2		
	a. Flash Charge	1.0 ea (2 required)	Overall Mixture: 32% Lead Thiocyanate 40% Potassium Chlorate 18% Charcoal 10% Egyptian Lacquer

TABLE B-1. ENERGETIC COMPONENTS OF CHEMICAL MUNITIONS (Cont'd)

Munition	Component	Weight, gr	Composition
M55 Rocket (con't)	b. Booster Igniter	46.2 ea (2 required)	Overall Mixture: 49% Magnesium 49% Potassium Perchlorate 2% Cellulose Nitrate-Camphor
	3. Igniter, Rocket Motor, M62	385.0	Overall Mixture: 49% Magnesium 49% Potassium Perchlorate 2% Cellulose Nitrate-Camphor
	4. Propellant Grain, M28	134,750	See Table B-2
	5. Burster, M34	22,400 (Total for M34 and M36)	Comp B (See Table B-2)
	6. Burster, M36	--	Comp B
	7. Pellet, Rocket Motor	3.1	Overall Mixture: 49% Mangesium 49% Potassium Perchlorate 2% Cellulose Nitrate-Camphor

TABLE B-1. ENERGETIC COMPONENTS OF CHEMICAL MUNITIONS (Cont'd)

Munition	Component	Weight,gr	Composition
M23 Land Mine	1. M603 Fuze		
	a. M45 Detonator		
	(1)	1.9	Overall Mixture: 53% Potassium Chlorate 25% Lead Sulfocyanate 17% Antimony Sulfide 5% Lead Azide
	(2)	4.2	Lead Azide
	(3)	1.9	RDX
	b. M120 Booster	172.5	RDX
	2. M38 Burster	5709.8	Comp B
	3. M48 Initiator	848.8	Comp B
	4. Booster	308.6	Tetryl
M360 Cartridge	1. Fuze, M508A1		
	a. Booster Lead Charge		
	(1)	3.55	Lead Azide
	(2)	3.77	Tetryl Lead
	b. Booster Charge	339.50	Tetryl

TABLE B-1. ENERGETIC COMPONENTS OF CHEMICAL MUNITIONS (Cont'd)

Munition	Component	Weight, gr	Composition
M360 Cartrige (con't)	c. Detonator, M18		Overall Mixture
	(1) Upper Charge	1.00	33.5% Potassium Chlorate 32.2% Antimony 28.3% Lead Azide 5.0% Carborundum
	(2) Intermediate Charge	2.95	Lead Azide
	(3) Lower Charge	1.24	Tetryl
	2. Burster, M40	7840.00	Tetrytol
	M40A	7840.00	Comp B
	3. Primer, M28B2	293.21	Black Powder
	4. Propellant, M67	19810.00	See Table B-2
M60 Cartridge	1. Fuze, M51A5		
	a. Booster, M121A4		
	(1) Booster Lead Charge		
	(a)	3.55	Lead Azide
	(b)	3.77	Tetryl Lead
	(2) Booster Charge	339.50	Tetryl

TABLE B-1. ENERGETIC COMPONENTS OF CHEMICAL MUNITIONS (Cont'd)

Munition	Component	Weight, gr	Composition
	b. Detonator, M24		
	(1) Upper Charge	1.05	Overall Mixture 33.4% Potassium Chlorate 33.3% Antimony Sulfide 17% Lead Azide 5.0% Carborundum
	(2) Lower Charge	2.86	Tetryl
	c. Delay Plunger Assembly, M1		
	(1) M54 Primer	0.17	Overall Mixture 53% Potassium Chloride 25% Lead Sulfocynate 17% Antimony Sulfide 5% TNT
	(2) Delay Pallet	0.29	Black Powder
	(3) Relay, M7	1.54	Lead Azide
	3. Burster, M5	2100.00	Tetrytol
	4. Primer M28B2	293.21	Black Powder
	5. Propellant, M67	19810.00	See Table B-2

TABLE B-1. ENERGETIC COMPONENTS OF CHEMICAL MUNITIONS (Cont'd)

Munition	Component	Weight, gr	Composition
M2/M2A1 (4.2" Mortar)	1. Fuze, M8		
	(a) Detonator, M18		
	(1) Upper Charge	0.77	Overall Mixture: 33.4% Potassium Chlorate 33.3% Antimony Sulfide 28.3% Lead Azide 5.0% Carborundum
	(2) Intermediate Charge	2.42	Lead Azide
	(3) Lower Charge	1.08	Tetryl
	(b) Lead Charge	2.03	Tetryl
	2. Burster, M14	980.00	Tetryl
	3. Ignition Cartridge, M2	7.5	M9 Propellant (See Table B-2)
	4. Propelling Charge, M6	4200.00	M8 Propellant (See Table B-2)
M104/110	Burster, M6	2870.00	Tetrytol
M121/M121 Projectile	Burster, M71	17150.00	Comp B
M122 Projectile	Burster, M37	17150.00	Tetrytol
M426 Projectile	Burster, M83	44000.00	Comp B

TABLE B-2. PHYSICAL AND CHEMICAL CHARACTERISTICS OF EXPLOSIVES AND PROPELLANTS

Energetic	Composition	Molecular Weight	Density	Explosion Temperature Test Value (°C)	Heat of Combustion (cal/g) at Constant Pressure
<u>Explosives</u>					
Tetrytol	70% tetryl 30% TNT	266	1.66	275	3136
Tetryl	2,4,6-Trinitrophenyl-methylnitramine	287.15	1.73 (crystal) 1.62 (cast)	257	2914
Composition B	60% RDX 39% TNT 1% presensitizer (wax)	224	1.65 (cast)	278	2790
TNT	2,4,6-trinitrotoluene	227.134	1.654 (crystal) 1.56 (cast) 1.465 (liquid)	475	3589.5
RDX	Cyclotrimethylene-trinitramine	222.126	1.816 (crystal)	260	2307

TABLE B-2. PHYSICAL AND CHEMICAL CHARACTERISTICS OF EXPLOSIVES AND PROPELLANTS (Cont'd)

Energetic	Composition	Molecular Weight	Density	Explosion Temperature Test Value (°C)	Heat of Combustion (cal/g) at Constant Pressure
Propellant Types					
M8	52.15% Nitrocellulose (13.15% N) 43.00% Nitroglycerin 3.0% Diethylphthalate 1.25% Potassium Nitrate 6.60% Ethyl Centralite	254.9	--	--	2914
M9	57.75% Nitrocellalose (13.15%N) 40.00% Nitroglycerine 1.50% Potassium Nitrate 0.75% Diphenylamine	258.9	--	--	
M28	60.0% Nitrocellulose 23.8% Nitroglycerine 9.9% Triacetin 2.6% Di-ethylphthalate 2.0% Lead Stearate 1.7% 2-Nitrodiphenylamine	253.4	--	--	2496
M67	86.1% Nitrocellulose (13.15% N) 9.9% Dinitrotoluene 3.0% Dibutylphthalate 1.0% Diphenylamine	259.4	--	--	2780

SECTION B-3

CHEMICAL AGENT FACT SHEETS

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TABLE B-3. CHEMICAL AGENT TABUN (GA) CHARACTERISTICS

GENERAL:

GA is an anticholinesterase agent similar in action to GB (q.v.). Although only about half as toxic as GB by inhalation, GA in low concentrations is more harassing to the eyes than GB. Individuals poisoned by GA display approximately the same sequence or symptoms regardless of the route by which the poison enters the body (whether by inhalation, adsorption, or ingestion). These symptoms, in normal order of appearance, are: runny nose; tightness of chest; dimness of vision and pinpointing of the eye pupils; difficulty in breathing; drooling and excessive sweating; nausea; vomiting; cramps; and involuntary defecation and urination; twitching; jerking; and staggering; and headache; confusion; drowsiness; coma; and convulsion. These symptoms are followed by cessation of breathing and death.

PHYSICAL PROPERTIES:

a. Chemical Name: Ethyl N, N-dimethylphosphoramido-cyanidate
b. Chemical Formula: Empirical. $C_5H_{11}N_2O_2P$
c. Molecular Weight: 162.1
d. Vapor Density, Relative to Air: 5.6
e. Liquid Density: 1.08 g/ml @ 25°C
f. Normal Freezing Point or Melting Point: -50°C
g. Boiling Point: 245°C
h. Vapor Pressure: 0.07 mm Hg @ 25°C
i. Flash Point: 78°C
j. Viscosity (centistokes @ 25°C): 2.18
k. Color: Colorless to brown
l. Odor: Faintly fruity; none when pure
m. Special Properties: None
n. Solubility Properties: Readily soluble in most organic solvents
o. H Combustion: 9,751 BTU/lb
p. Physical State: Viscous Liquid

TABLE B-3. CHEMICAL AGENT TABUN (GA) CHARACTERISTICS (Cont'd)

TOXICITY:

ihl-rat	LC_t50:	450 mg min/m^3 (t=10)
ihl-rbt	LC_t50:	960 mg min/m^3 (t=10)
ihl-dog	LC_t50:	320 mg min/m^3 (t=10)
ihl-mky	LC_t50:	187 mg min/m^3 (t=10)
ivn-rat	LD50:	0.07 mg/kg
ivn-rbt	LD50:	0.063 mg/kg
ivn-dog	LD50:	0.084 mg/kg
ivn-mky	LD50:	0.05 mg/kg

TABLE B-4. CHEMICAL AGENT SARIN (GB) CHARACTERISTICS

GENERAL:

GB is a rapid-acting lethal nerve agent. The action within the body is the inactivation of cholinesterase. The hazard from GB is that of vapor adsorption through the respiratory tract, although it can be absorbed through any part of the skin, through the eyes, and through the gastrointestinal tract by ingestion. The agent absorption rate is accelerated through cuts and abrasions in the skin. When dispersed as large droplets, GB is moderately persistent; it is nonpersistent when disseminated as a cloud of very fine particles.

PHYSICAL PROPERTIES:

a. Chemical Name: Isopropylmethylphosphonofluoridate. Sarin.
b. Chemical Formula: $C_4H_{10}FO_2P$
c. Molecular Weight: 140.10
d. Vapor Density (Air = 1.00): 4.86
e. Liquid Density at $25^{c}C$: 1.0887 gm/cc
f. Freezing Point: $-56^{\circ}C$
g. Boiling Point: $158^{\circ}C$
h. Vapor Pressure: 2.9 mm Hg @ $25^{\circ}C$
i. Flash Point: Does not flash
j. Viscosity (centistokes @ $25^{\circ}C$): 1.28
k. Color: Clear to straw to amber
l. Odor: None
m. Special Properties: None
n. Solubility Properties: Miscible with water and readily soluble in all organic solvents
o. H Combustion: 10,000 Btu/lb
p. Physical State: Viscous Liquid

TABLE B-4. CHEMICAL AGENT SARIN (GB) CHARACTERISTICS (Cont'd)

COMPOSITION:	Percent[a]
Isopropyl methyl phosphonofluoridate (GB)	93.00
N,N'-Diisopropylcarbodimide (DICDI)[b]	4.00
Tributylamine (TBA)[b]	1.95
Methyl Difluoride	0.50
HF	0.20
Aluminum	0.20
HCl	0.10
Iron	0.05
Nickel	0.0025
Copper	0.0004

TOXICITY:

IRDS:	eye-hmn:	1 ug/kg
TXDS:	orl-hmn TDLo:	2 ug/kg TFX:BLD
	skn-hmn LD50:	28 mg/kg
	ihl-hmn TDLo:	103 ug/kg TFX:CNS
	ihl-hmn LC50:	70 mg/m^3
	orl-rat LD50:	550 ug/kg
	scu-rat LD50:	113 ug/kg
	ivn-rat LD50:	45 ug/kg
	ims-rat LD50:	500 ug/kg
	skn-mus LD50:	1080 ug/kg
	ipr-mus LD50:	450 ug/kg
	scu-mus LD50:	100 ug/kg
	ims-mus LD50:	222 ug/kg
	ivn-dog LD50:	19 ug/kg
	ivn-cat LD50:	22 ug/kg
	skn-rbt LD50:	925 ug/kg
	scu-rbt LD50:	30 ug/kg

TABLE B-4. CHEMICAL AGENT SARIN (GB) CHARACTERISTICS (Cont'd)

ivn-rbt LD50:	28 ug/kg
ihl-gpg LDLo:	128 $mg/m^3/2m$
scu-gpg LD50:	38 ug/kg

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[a] These numbers are given as a guide only and do not represent product specifications or the exact constituency of the agent.

[b] DICIDI and TBA are not both in all GB.

TABLE B-5. CHEMICAL AGENT VX CHARACTERISTICS

GENERAL:

VX is a rapid-acting lethal nerve agent. The action within the body is the inactivation of cholinesterase. The hazard from VX is primarily that of liquid absorption through the skin, although it can be adsorbed through the respiratory tract as a vapor or aerosol, and through the gastrointestinal tract by ingestion. VX is slow to evaporate and may persist as a liquid for several days.

PHYSICAL PROPERTIES:

a. Chemical Name: O-ethyl S-(2-diisopropylaminoethyl) Methylphosphonothiolate
b. Chemical Formula: $C_{11}H_{26}NO_2PS$
c. Molecular Weight: 267.37
d. Vapor Density (Air = 1.0): 9.2
e. Liquid Density at 25°C: 1.008 gm/cc
f. Freezing Point: Below -39°C
g. Boiling Point: 300°C
h. Vapor Pressure @ 20°C: 0.0006 mm Hg
i. Flash Point: 159°C
j. Viscosity (centistokes @ 25°C): 9.96
k. Color: Clear to straw
l. Odor: None
m. Special Properties: None
n. Solubility Properties: Best solvents are dilute mineral acids
o. H Combustion: 15,000 Btu/lb
p. Physical State: Viscous Liquid

TABLE B-5. CHEMICAL AGENT VX CHARACTERISTICS (Cont'd)

COMPOSITION:	Percent[a]
O-ethyl, S-(2-diisopropylaminoethyl) methylphosphonothiolate (VX)	93.00
Pyrodiester	3.00
N,N'Diisopropylcarbodiamide (DICDI)[b]	2.50
Free mercaptan	1.00
H_2SO_4	0.30
Free sulphur	0.14
Iron	0.05
Aluminum	0.01
Nickel	0.0025
Copper	0.0004

TOXICITY:

TXDS:	orl-man TDLo:	4	ug/kg	RFX:RBC
	skn-hmn LDLo:	86	ug/kg	
	ivn-man TDLo:	1500	ng/kg	RFX:CNS
	ipr-mus LD50:	50	ug/kg	
	scu-rbt LD50:	15	ug/kg	
	scu-gpg LD50:	8400	ng/kg	

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a These numbers are given as a guide only and do not represent product specifications or the exact constituency of the agent.

b Dicyclohexylcarbodiamide is an alternate stabilizer.

TABLE B-6. CHEMICAL AGENT MUSTARD (H/HD/HT) CHARACTERISTICS

GENERAL:

Mustard is a persitent and powerful blistering agent. It acts principally by poisoning the cells in the surfaces contacted. Both liquid and vapor cause intense inflammation and may cause severe blistering of both the skin and mucous membranes. Mustard is only moderately volatile.

Mustard is designated H, HD, and HT. H is mustard made by the Levinstein process. It containes up to 25 percent by weight of impurities, chiefly sulfur, organosulfur chlorides and polysulfides. HD (distilled mustard) is mustard purified by washing and vacuum distillation, which reduces impurities to about 5 percent. HT is a 60:40 mixture by weight of HD and T. T is an abbreviation for ½2(2-chloroethylthio)ethyl½ ether.

PHYSICAL PROPERTIES:

a. Chemical Name: Bis (2-chloroethyl) sulfide
   2,2'- dichlorodiethyl sulfide- sulfur mustard

b. Chemical Formula: $(ClCH_2CH_2)_2S$

	H	HD	HT
c. Molecular Weight:	175.00	159.08	189.40
d. Vapor Density, (air= 1.0):	5.40	5.40	6.92
e. Liquid Density gm/cc at 20°:	1.27	1.27	1.27
f. Normal Freezing Point, °C	5.14	14.00	1.00
g. Boiling Point, °C:	225.40	227.80	228.00
h. Vapor Pressure, mm Hg @ 20°C:	0.059	0.072	0.104
i. Flash Point, °C:	100.00	105.00	100.00
j. Viscosity, centistokes @ 20°C:	3.95	3.95	6.05

k. Color: Amber--dark brown liquid (all)

l. Odor: Garlic (all)

m. Special Properties: Permeates ordinary rubber (all)

TABLE B-6. CHEMICAL AGENT MUSTARD (H/HD/HT) CHARACTERISTICS (cont'd)

n. Solubility Properties: Water (distilled)--0.092 at 22^{o}C; completely soluble in acetone, CCl_4, CH_3CL, tetrachloroethane, ethyl benzoate, ether (all)

	H	HD	HT
o. H Combustion: (Btu/lb):	8,100	8,500	9,400

p. Physical State: Viscous Liquid (all)

COMPOSITION OF HD:	Percent[a]
Bis (2-chloroethyl) sulfide (HD-mustard)	92.00
Free sulphur	7.38
$FeCl_2$	0.50
HCl	0.11
Aluminum	0.01
Nickel	0.0025
Copper	0.0004

COMPOSISTION OF H:	Percent[a]
Bis (2-chloroethyl) sulfide (mustard)	67.7
Ferris chloride	0.3
Hydrochloric Acid	0.3
Iron Carbide	2.5
Iron Sulfide	1.5
Chlorinated Hydrocarbons	14.4
Elemental Sulphur	11.3
Carbon Disulfide	2.0

TOXICITY:

MTDS: mrc-esc 5 ug/well
dlt-mus-ihl 630 ug/kg

IRDS: skn-man 200 mg/m^3 1H SEV
eye-man 100 mg/m^3/6H MOD
eye-rbt 200 mg/m^3/2M

TABLE B-6. CHEMICAL AGENT MUSTARD (H/HD/HT) CHARACTERISTICS (cont'd)

TXDS:	ihl-hmn LD50:	1500 mg/m^3/M
	ihl-hmn LCLo:	23 ppm/10M
	skn-hmn LDLo:	64 mg/kg
	ihl-rat LD50:	420 mg/m^3/2M
	ihl-rat TCLo:	100 ug/,^{3}/1Y-i TFX:CAR
	skn-rat LD50:	9 mg/kg
	scu-rat LD50:	1500 ug/kg
	ivn-rat LD50:	700 ug/kg
	ihl-mus LCLo:	189 mg/m^3/10M
	skn-mus LD50:	92 mg/kg
	ihl-mus TCLo:	170 ppm/15M-C TFX/CAR
	skn-mus LDLo:	4 mg/kg
	scu-mus TDLo:	6 mg/kg/6W-1 TFX:CAR
	ivn-mus LD50:	8600 ug/kg
	ivn-mus TDLo:	60 ug/kg/6D-1 TFX:CAR
	skn-dog LD50:	20 mg/kg
	skn-rbt LD50:	100 mg/kg
	ivn-rbt LD50:	1100 mg/kg
	skn-gpg LD50:	20 mg/kg
	skn-dom LD50:	50 mg/kg

[a] These numbers are given as a guide only and do not represent product specifications or the exact constituency of the agent.

TABLE B-7. CHEMICAL AGENT LEWISITE (L) CHARACTERISTICS

GENERAL:

L is a vesicant. It produces effects similar to HD but, in addition, acts as a systemic poison, causing pulmonary edema, diarrhea, restlessness, weakness, subnormal temperature, and low blood pressure. In order of severity and appearance of symptoms, it is: a blister agent, a toxic lung irritant, and when absorbed in the tissues, a systemic poison. Liquid L causes an immediate searing sensation in the eye and permanent loss of sight if not decontaminated within 1 minute. L produces an immediate and strong stinging sensation to the skin; reddening of the skin starts within 30 minutes. Blistering does not appear until after about 13 hours. Like HD, it is a cell poison. Skin burns are much deeper than with HD. When inhaled in high concentrations it may be fatal in as short a time as 10 minutes. The body does not detoxify L.

PHYSICAL PROPERTIES:

a. Chemical Name: Dichloro-2-chlorovinylarsine, lewisite
b. Chemical Formula: $C_2H_2AsCl_3$
c. Molecular Weight: 207.32
d. Vapor Density: 1.88 g/ml @ 25°C
e. Solid Density:
   1) Bulk Density: Not applicable
   2) Crystal Density: Not applicable
f. Normal Freezing Point or Melting Point: -18°C +/- 0.1°C, depending on (purity and isomers present)
g. Boiling Point: 190°C
h. Vapor Pressure: 0.58 mm Hg @ 25°C
i. Flash Point: Does not flash
j. Viscosity: 1.09 centistokes @ 25°C
k. Color: Amber to dark brown
l. Odor: Usually geranium like, very little odor when pure
m. Special Properties: None

TABLE B-7. CHEMICAL AGENT LEWISITE (L) CHARACTERISTICS (Con't)

n. Solubility Properties: Soluble in all common organic solvents and slightly soluble in water

o. H Combustion: High heating value 4,676 BTU/lb; low heating value 4,583 BTU/lb

p. Physical State: Viscous Liquid

Toxicity:

skn-mus	LC_t50:	900-1400 mg-min/m^3 (t=10min)
skn-rat	LC_t50:	1500 mg min/m^3 (t=9-25 min)
skn-gpg	LC_t50:	1000 mg-min/m^3 (t=9-14 min)
skn-rbt	LC_t50:	1500 mg-min/m^3 (t=60-180 min)
skn-got	LC_t50:	1250 mg-min/m^3 (t=100-255 min)
ihl-mus	LC_t50:	1600 mg-min/m^3 (t=10 min)
ivn-rbt	LD50:	2 mg/kg
pvn-dog	LD50:	2 mg/kg
scu-rbt	LD50:	1 mg/kg
scu-gpg	LD50:	1 mg/kg

APPENDIX D

DETAILED METEOROLOGICAL DATA

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Table D-1: TEAD Pasquill Stabality Frequency Data

PASQUILL STABILITY FREQUENCY													
CATEGORY	MONTHLY FREQUENCY												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	AUG	SEP	OCT	NOV	DEC
A	0.0000	0.0000	0.0000	0.0097	0.0323	0.0514	0.0376	0.0215	0.0215	0.0000	0.0000	0.0000	0.0000
B	0.0000	0.0238	0.0591	0.1111	0.1183	0.1389	0.1089	0.1680	0.1680	0.1389	0.0914	0.0000	0.0000
C	0.1075	0.1384	0.1344	0.1319	0.1156	0.1208	0.1250	0.1573	0.1573	0.1153	0.1304	0.1583	0.1452
D	0.4207	0.4524	0.4476	0.4194	0.4368	0.4167	0.4180	0.2702	0.2702	0.3375	0.3602	0.3542	0.4194
E	0.2070	0.1935	0.1747	0.1569	0.1720	0.1472	0.1613	0.1868	0.1882	0.1903	0.1882	0.2125	0.2003
F	0.2648	0.1920	0.1841	0.1708	0.1250	0.1250	0.1492	0.1962	0.1949	0.2181	0.2298	0.2750	0.2352

CATEGORY	AVERAGE FREQUENCY					
	ANNUAL	WINTER (0.2466)	SPRING (0.2521)	SUMMER (0.2521)	SUMMER (0.2521)	FALL (0.2493)
A	0.0128	0.0000	0.0140		0.0367	0.0000
B	0.0801	0.0074	0.0960		0.1386	0.0769
C	0.1316	0.1301	0.1273		0.1345	0.1346
D	0.3958	0.4301	0.4348		0.3678	0.3507
E	0.1826	0.2005	0.1680		0.1658	0.1969
F	0.1970	0.2319	0.1599		0.1567	0.2408

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Table D-2: Pasquill Stability Category A Wind Speed (Knots) Distribution

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	>21	TOTAL
N	0.000000	0.053578	0.000000	0.000000	0.000000	0.000000	0.053578
NNE	0.000000	0.008917	0.000000	0.000000	0.000000	0.000000	0.008917
NE	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
ENE	0.026750	0.026750	0.000000	0.000000	0.000000	0.000000	0.053578
E	0.008917	0.026750	0.000000	0.000000	0.000000	0.000000	0.035745
ESE	0.000000	0.008917	0.000000	0.000000	0.000000	0.000000	0.008917
SE	0.000000	0.017833	0.000000	0.000000	0.000000	0.000000	0.017833
SSE	0.017833	0.089323	0.000000	0.000000	0.000000	0.000000	0.107157
S	0.044662	0.116074	0.000000	0.000000	0.000000	0.000000	0.160735
SSW	0.035745	0.035745	0.000000	0.000000	0.000000	0.000000	0.071412
SW	0.017833	0.089323	0.000000	0.000000	0.000000	0.000000	0.107157
WSW	0.008917	0.035745	0.000000	0.000000	0.000000	0.000000	0.044662
W	0.026750	0.053578	0.000000	0.000000	0.000000	0.000000	0.080329
WNW	0.017833	0.062495	0.000000	0.000000	0.000000	0.000000	0.080329
NW	0.008917	0.071412	0.000000	0.000000	0.000000	0.000000	0.080329
NNW	0.000000	0.089323	0.000000	0.000000	0.000000	0.000000	0.089323
TOTAL	0.214157	0.785765	0.000000	0.000000	0.000000	0.000000	1.000000

RELATIVE FREQUENCY OF OCCURRENCE OF " A ' STABILITY = 0.012785

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH " A " STABILITY = 0.000000

CONVERSAIONS:
Multiply by 0.5144 for meters/sec
Multiply by 0.8690 for miles/hour

Table D-3: Pasquill Stability Category B Wind Speed (Knots) Distribution

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	>21	TOTAL
N	0.006903	0.010430	0.008689	0.000579	0.000000	0.000000	0.021057
NNE	0.009479	0.005796	0.002319	0.000579	0.000000	0.000000	0.010557
NE	0.009170	0.002319	0.001157	0.000000	0.000000	0.000000	0.005283
ENE	0.003091	0.001157	0.000000	0.000000	0.000000	0.000000	0.001766
E	0.018057	0.001157	0.001736	0.000000	0.000000	0.000000	0.006451
ESE	0.003634	0.005796	0.004634	0.000000	0.000000	0.000000	0.014064
SE	0.009795	0.021438	0.012166	0.000000	0.000000	0.000000	0.043399
SSE	0.019286	0.024915	0.002898	0.000000	0.000000	0.000000	0.047094
S	0.013155	0.011008	0.005796	0.000000	0.000000	0.000000	0.029955
SSW	0.007740	0.004634	0.005796	0.000000	0.000000	0.000000	0.018170
SW	0.005365	0.003477	0.005796	0.000000	0.000000	0.000000	0.014632
WSW	0.004852	0.008110	0.004055	0.000000	0.000000	0.000000	0.017023
W	0.009029	0.011008	0.006375	0.000000	0.000000	0.000000	0.026412
WNW	0.007831	0.009851	0.011587	0.000579	0.000000	0.000000	0.029848
NW	0.011526	0.019119	0.015064	0.000000	0.000000	0.000000	0.045708
NNW	0.001365	0.026072	0.039978	0.002319	0.000000	0.000000	0.075297
TOTAL	0.140279	0.166288	0.128045	0.004055	0.000000	0.000000	0.406716

RELATIVE FREQUENCY OF OCCURRENCE OF " B " STABILITY = 0.080137

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH " B " STABILITY = 0.000913

CONVERSAIONS:
Multiply by 0.5144 for meters/sec
Multiply by 0.8690 for miles/hour

Table D-4: Pasquill Stability Category C Wind Speed (Knots) Distribution

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	>21	TOTAL
N	0.006578	0.005212	0.033604	0.011008	0.000000	0.000000	0.056402
NNE	0.006537	0.002898	0.002319	0.000000	0.000000	0.000000	0.011749
NE	0.002563	0.000579	0.001736	0.000000	0.000000	0.000000	0.004882
ENE	0.000995	0.000579	0.001736	0.001157	0.000000	0.000000	0.004471
E	0.004553	0.001736	0.002898	0.000579	0.000000	0.000000	0.009765
ESE	0.005212	0.005796	0.004634	0.001736	0.000000	0.000000	0.017378
SE	0.030442	0.021438	0.023174	0.002898	0.000000	0.000000	0.077952
SSE	0.068207	0.034761	0.017962	0.001157	0.000000	0.000000	0.122087
S	0.022377	0.009851	0.010430	0.002898	0.000000	0.000000	0.045551
SSW	0.010506	0.005212	0.006953	0.007532	0.000579	0.000000	0.030782
SW	0.004553	0.001736	0.008110	0.000579	0.000579	0.000000	0.015556
WSW	0.004344	0.001157	0.001736	0.001157	0.000000	0.000000	0.008400
W	0.008354	0.005796	0.011008	0.002898	0.000000	0.000000	0.028051
WNW	0.013693	0.007532	0.009851	0.005212	0.000000	0.000000	0.036289
NW	0.016667	0.009268	0.011008	0.000228	0.000000	0.000000	0.038105
NNW	0.027336	0.023752	0.079951	0.005822	0.000000	0.000000	0.160593
TOTAL	0.232916	0.137303	0.227110	0.044861	0.001157	0.000000	0.668013

RELATIVE FREQUENCY OF OCCURRENCE OF " C " STABILITY = 0.131621

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH " C " STABILITY = 0.019178

CONVERSAIONS:
Multiply by 0.5144 for meters/sec
Multiply by 0.8690 for miles/hour

Table D-5: Pasquill Stability Category D Wind Speed (Knots) Distribution

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	>21	TOTAL
N	0.049982	0.032447	0.052144	0.069527	0.015064	0.002898	0.222055
NNE	0.017185	0.004634	0.002898	0.001157	0.000000	0.000000	0.025874
NE	0.005009	0.003477	0.000579	0.001157	0.000000	0.000000	0.010222
ENE	0.006167	0.002319	0.002319	0.000000	0.000000	0.000000	0.010800
E	0.015444	0.006375	0.002319	0.000579	0.000579	0.000000	0.025295
ESE	0.097466	0.037080	0.037659	0.017962	0.003477	0.000000	0.193644
SE	0.190700	0.048089	0.064309	0.041135	0.001736	0.000000	0.345974
SSE	0.140363	0.034182	0.037659	0.027229	0.001736	0.000579	0.241753
S	0.059934	0.024915	0.018540	0.028970	0.008689	0.002898	0.143946
SSW	0.026407	0.007532	0.008110	0.030706	0.008689	0.010430	0.091878
SW	0.007958	0.001736	0.001157	0.005796	0.000579	0.000000	0.017231
WSW	0.001264	0.001157	0.000579	0.002898	0.000000	0.000000	0.005903
W	0.009856	0.003477	0.003477	0.006375	0.000000	0.000000	0.023184
WNW	0.014866	0.006953	0.006375	0.001736	0.000000	0.000000	0.029929
NW	0.060406	0.022017	0.013328	0.005212	0.000579	0.000000	0.101542
NNW	0.094792	0.057940	0.108343	0.217843	0.033604	0.006953	0.519469
TOTAL	0.797799	0.294328	0.359794	0.458281	0.074729	0.023758	2.008699

RELATIVE FREQUENCY OF OCCURRENCE OF " D " STABILITY = 0.395776

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH " D " STABILITY = 0.112329

CONVERSAIONS:
Multiply by 0.5144 for meters/sec
Multiply by 0.8690 for miles/hour

Table D-6: Pasquill Stability Category E Wind Speed (Knots) Distribution

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	>21	TOTAL
N	0.045551	0.022595	0.001157	0.000579	0.000000	0.000000	0.069887
NNE	0.014729	0.006953	0.000579	0.000000	0.000000	0.000000	0.022260
NE	0.010075	0.002319	0.000000	0.000000	0.000000	0.000000	0.012389
ENE	0.008009	0.002319	0.000579	0.000000	0.000000	0.000000	0.010907
E	0.027777	0.010430	0.002319	0.000000	0.000000	0.000000	0.040521
ESE	0.129583	0.052144	0.028970	0.000000	0.000000	0.000000	0.210692
SE	0.188893	0.028970	0.008110	0.000000	0.000000	0.000000	0.225973
SSE	0.084692	0.009268	0.003477	0.000000	0.000000	0.000000	0.097436
S	0.023245	0.004634	0.003477	0.000000	0.000000	0.000000	0.031355
SSW	0.013247	0.006375	0.001736	0.000000	0.000000	0.000000	0.021357
SW	0.007227	0.000000	0.000000	0.000000	0.000000	0.000000	0.007227
WSW	0.006649	0.000579	0.000000	0.000000	0.000000	0.000000	0.007227
W	0.005613	0.000579	0.000579	0.000000	0.000000	0.000000	0.006776
WNW	0.013622	0.002898	0.000000	0.000000	0.000000	0.000000	0.016520
NW	0.033842	0.011587	0.001157	0.000000	0.000000	0.000000	0.046591
NNW	0.062802	0.030127	0.005212	0.001736	0.000000	0.000000	0.099882
TOTAL	0.675555	0.191776	0.057351	0.002314	0.000000	0.000000	0.927002

RELATIVE FREQUENCY OF OCCURRENCE OF " E " STABILITY = 0.182648

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH " E " STABILITY = 0.075000

CONVERSAIONS:
Multiply by 0.5144 for meters/sec
Multiply by 0.8690 for miles/hour

Table D-7: Pasquill Stability Category F Wind Speed (Knots) Distribution

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	>21	TOTAL
N	0.036294	0.002319	0.000000	0.000000	0.000000	0.000000	0.038608
NNE	0.037451	0.001157	0.000000	0.000000	0.000000	0.000000	0.038608
NE	0.024519	0.000579	0.000000	0.000000	0.000000	0.000000	0.025097
ENE	0.026447	0.000579	0.000000	0.000000	0.000000	0.000000	0.027026
E	0.047104	0.001157	0.000000	0.000000	0.000000	0.000000	0.048261
ESE	0.183975	0.005212	0.000000	0.000000	0.000000	0.000000	0.189188
SE	0.289187	0.008110	0.000000	0.000000	0.000000	0.000000	0.297297
SSE	0.156178	0.004055	0.000000	0.000000	0.000000	0.000000	0.160233
S	0.034751	0.000000	0.000000	0.000000	0.000000	0.000000	0.034751
SSW	0.022585	0.000579	0.000000	0.000000	0.000000	0.000000	0.023164
SW	0.001929	0.000000	0.000000	0.000000	0.000000	0.000000	0.001929
WSW	0.005791	0.000000	0.000000	0.000000	0.000000	0.000000	0.005791
W	0.011582	0.000000	0.000000	0.000000	0.000000	0.000000	0.011582
WNW	0.009075	0.000579	0.000000	0.000000	0.000000	0.000000	0.009653
NW	0.030888	0.000000	0.000000	0.000000	0.000000	0.000000	0.030888
NNW	0.055016	0.002898	0.000000	0.000000	0.000000	0.000000	0.057914
TOTAL	0.972771	0.027224	0.000000	0.000000	0.000000	0.000000	0.999990

RELATIVE FREQUENCY OF OCCURRENCE OF " F " STABILITY = 0.197032

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH " F " STABILITY = 0.137900

CONVERSAIONS:
Multiply by 0.5144 for **meters/sec**
Multiply by 0.8690 for **miles/hour**

APPENDIX E
Detailed Dispersion Data

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SECTION E.1

Meteorological Dispersion Worksheets

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METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER:PO-AGC-041
AGENT: GB
SEASON: ALL

MODE: SEM
AMOUNT: 101.4_lbs 45,990,146mg To convert from lbs to mg multiply by 453,592
TQ: ________min

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	4,509
			5.00	5.75	2.57		2,544
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	11,963
			5.00	5.75	2.57		4,883
			8.50	9.78	4.37		3,470
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	63,928
			5.00	5.75	2.57		25,174
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

==

ID NUMBER: PO-BGC-042
AGENT: ___GB____
SEASON: ALL

MODE: ___SEM___
AMOUNT: __21.98__lbs ____9,969,499________mg To convert from lbs to mg multiply by 453,592
TQ: ____12__min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,048
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	3,580
			5.00	5.75	2.57		1,905
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	12,855
			5.00	5.75	2.57		4,675
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: PO-CGC-042

AGENT: GB

SEASON: ALL

MODE: SEM

AMOUNT: 5.79 lbs 2,628.112 mg To convert from lbs to mg multiply by 453,592

TQ: 12 min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	101
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	1,667
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	3,587
			5.00	5.75	2.57		1,743
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-KGC-042_______
AGENT: ___GB____
SEASON: ALL

MODE: __SEM__
AMOUNT: __35.24__lbs ___15,983,221________mg To convert from lbs to mg multiply by 453,592
TQ: __12_____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,621
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	4,808
			5.00	5.75	2.57		2,536
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	21,128
			5.00	5.75	2.57		7,856
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-KHC-042______
AGENT: ___HD____
SEASON: ALL

MODE: __SEM____
AMOUNT: __42.46__lbs ___19,259,516________mg To convert from lbs to mg multiply by 453,592
TQ: __17____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	(knots)	WIND SPEED (mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	786
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	(knots)	WIND SPEED (mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	1,321
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	(knots)	WIND SPEED (mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	2,940
			5.00	5.75	2.57		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-KVC-042______
AGENT: ___VX____
SEASON: ALL

MODE: __SEM____
AMOUNT: __39.99__lbs ___18,140,958___.____mg To convert from lbs to mg multiply by 453,592
TQ: __12____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	4,410
			5.00	5.75	2.57		2,527
			8.50	9.78	4.37		N/A
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	11,393
			5.00	5.75	2.57		4,838
			8.50	9.78	4.37		3,469
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	59,842
			5.00	5.75	2.57		23,830
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-KGF-045_______
AGENT: ___GB____
SEASON: ALL

MODE: __SEM____
AMOUNT: _________lbs ___22,838,357__________mg To convert from lbs to mg multiply by 453,592
TQ: __106____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,530
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	4,934
			5.00	5.75	2.57		2,261
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	29,132
			5.00	5.75	2.57		6,906
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-DHC-049_______
AGENT: ___HD____
SEASON: ALL

MODE: __SEM____
AMOUNT: __5.998__lbs ____2,720,645________mg To convert from lbs to mg multiply by 453,592
TQ: ____2____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	257
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	389
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	755
			5.00	5.75	2.57		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-CGC-049_______
AGENT: ___GB____
SEASON: ALL

MODE: __INS____
AMOUNT: __1.6____lbs ______725,747_________mg To convert from lbs to mg multiply by 453,592
TQ: ___N/A___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	810
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	1,284
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	2,499
			5.00	5.75	2.57		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-PGC-049______
AGENT: ___GB____
SEASON: ALL

MODE: __INS____
AMOUNT: _6.501___lbs ____2,948,807________mg To convert from lbs to mg multiply by 453,592
TQ: ___N/A___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	1,632
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	2,739
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	7,387
			5.00	5.75	2.57		3,481
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

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ID NUMBER: _PO-PHC-049______
AGENT: ___HD____
SEASON: ALL

MODE: __SEM____
AMOUNT: _11.695__lbs ____5,304,758________mg To convert from lbs to mg multiply by 453,592
TQ: ___2_____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	376
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	590
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	1,196
			5.00	5.75	2.57		N/A
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-PVC-049______
AGENT: ___VX____
SEASON: ALL

MODE: __SEM____
AMOUNT: __5.998__lbs ____2,720,645________mg To convert from lbs to mg multiply by 453,592
TQ: ___2_____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	1,719
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	2,875
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	8,238
			5.00	5.75	2.57		3,730
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-QBC-049_______
AGENT: ___GB____
SEASON: ALL

MODE: __INS____
AMOUNT: _14.488__lbs ____6,571,641________mg To convert from lbs to mg multiply by 453,592
TQ: ___N/A___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,435
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	4,313
			5.00	5.75	2.57		2,611
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	17,105
			5.00	5.75	2.57		6,832
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-RGC-049______
AGENT: ___GB___
SEASON: ALL

MODE: __INS___
AMOUNT: _10.691__lbs ____4,849,352________mg To convert from lbs to mg multiply by 453,592
TQ: ___N/A___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,092
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	3,607
			5.00	5.75	2.57		2,201
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	12,452
			5.00	5.75	2.57		5,081
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-RVC-049_______
AGENT: ___VX____
SEASON: ALL

MODE: __SEM____
AMOUNT: ___10____lbs ____4,535,920________mg To convert from lbs to mg multiply by 453,592
TQ: ___2_____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,219
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	3,813
			5.00	5.75	2.57		2,336
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	14,052
			5.00	5.75	2.57		5,678
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-DVC-050______
AGENT: ___HD____
SEASON: ALL

MODE: __SEM____
AMOUNT: __5.998__lbs ____42,720,645_______mg To convert from lbs to mg multiply by 453,592
TQ: ___2____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	257
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	389
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	755
			5.00	5.75	2.57		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-CGC-050______
AGENT: ___GB____
SEASON: ALL

MODE: __INS____
AMOUNT: __1.6____lbs ______725,747_______mg To convert from lbs to mg multiply by 453,592
TQ: __N/A____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	810
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	1284
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	2,499
			5.00	5.75	2.57		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-PGC-050______
AGENT: ___GB____
SEASON: ALL

MODE: __INS____
AMOUNT: __6.501__lbs _____2,948,802_______mg To convert from lbs to mg multiply by 453,592
TQ: __N/A____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	1,632
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	2,739
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	7,387
			5.00	5.75	2.57		3,461
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-PHC-050_______
AGENT: ___HD____
SEASON: ALL

MODE: __SEM____
AMOUNT: _11.695__lbs _____5,304,758_______mg To convert from lbs to mg multiply by 453,592
TQ: ____2____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	376
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	590
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	1,196
			5.00	5.75	2.57		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-PVC-050______
AGENT: ___VX___
SEASON: ALL

MODE: __SEM____
AMOUNT: __5.998__lbs _____2,720,645_______mg To convert from lbs to mg multiply by 453,592
TQ: ____2___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	1,719
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	2,875
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	8,238
			5.00	5.75	2.57		3,730
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-RGC-050_______
AGENT: ___GB____
SEASON: ALL

MODE: __INS____
AMOUNT: _10.691__lbs _____4,849,352________mg To convert from lbs to mg multiply by 453,592
TQ: ___N/A___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,092
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	3,607
			5.00	5.75	2.57		2,201
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	12,452
			5.00	5.75	2.57		5,081
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-RVC-050______
AGENT: ___VX____
SEASON: ALL

MODE: __SEM____
AMOUNT: ____10___lbs _____4,535,920_______mg To convert from lbs to mg multiply by 453,592
TQ: ____2___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,219
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	3,813
			5.00	5.75	2.57		2,336
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	14,052
			5.00	5.75	2.57		5,678
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-KGF-051_______
AGENT: ___GB____
SEASON: ALL

MODE: __SEM____
AMOUNT: _29.973__lbs ____13,141,921________mg To convert from lbs to mg multiply by 453,592
TQ: ___61____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,002
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	3,661
			5.00	5.75	2.57		1,757
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	16,310
			5.00	5.75	2.57		4,281
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-KHF-051______
AGENT: ___HD____
SEASON: ALL

MODE: __SEM____
AMOUNT: _17.989__lbs _____8,159,666_______mg To convert from lbs to mg multiply by 453,592
TQ: ___69___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	481
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	772
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	1,610
			5.00	5.75	2.57		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-DHC-052______
AGENT: ___HD____
SEASON: ALL

MODE: __SEM____
AMOUNT: __5.998__ lbs _____2,720,645________mg To convert from lbs to mg multiply by 453,592
TQ: ____2____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	(knots)	WIND SPEED (mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	257
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	(knots)	WIND SPEED (mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	389
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	(knots)	WIND SPEED (mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	755
			5.00	5.75	2.57		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-CGC-052_______
AGENT: ___GB____
SEASON: ALL

MODE: __INS____
AMOUNT: __1.6____lbs _______725,747_______mg To convert from lbs to mg multiply by 453,592
TQ: ___N/A___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	(knots)	WIND SPEED (mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	810
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	(knots)	WIND SPEED (mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	1,284
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	(knots)	WIND SPEED (mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	2,499
			5.00	5.75	2.57		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-DHC-052______
AGENT: ___HD____
SEASON: ALL

MODE: __SEM____
AMOUNT: __5.998__lbs _____2,720,645_______mg To convert from lbs to mg multiply by 453,592
TQ: ____2____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	257
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	389
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	755
			5.00	5.75	2.57		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-RGC-052______
AGENT: ___GB____
SEASON: ALL

MODE: __INS____
AMOUNT: _10.691__lbs _____4,849,352_______mg To convert from lbs to mg multiply by 453,592
TQ: ___N/A___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,092
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	3,607
			5.00	5.75	2.57		2,201
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	12,452
			5.00	5.75	2.57		5,081
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-MVC-052______
AGENT: ___VX____
SEASON: ALL

MODE: __SEM____
AMOUNT: _10.495__lbs _____4,760,448_______mg To convert from lbs to mg multiply by 453,592
TQ: ____2___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,274
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	3,916
			5.00	5.75	2.57		2,399
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	14,779
			5.00	5.75	2.57		5,931
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-RGC-052______
AGENT: ___GB____
SEASON: ALL

MODE: __INS____
AMOUNT: _10.691__lbs _____4,849,352_______mg To convert from lbs to mg multiply by 453,592
TQ: ___N/A___min

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,092
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	3,607
			5.00	5.75	2.57		2,201
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	Deg C	WIND SPEED (knots)	(mi/hr)	(m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	12,452
			5.00	5.75	2.57		5,081
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

METOROLOGICAL DISPERSION WORKSHEET

ID NUMBER: _PO-MVC-052______
AGENT: ___VX____
SEASON: ALL

MODE: __SEM____
AMOUNT: _10.495__lbs _____4,760,448_______mg To convert from lbs to mg multiply by 453,592
TQ: ____2____min

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
D	- -	- -	1.50	1.73	0.77	200.00	2,274
			5.00	5.75	2.57		N/A
			8.50	9.78	4.37		
			13.50	15.54	6.94		
			19.00	21.86	9.77		
			21.00	24.17	10.80		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
E	- -	- -	1.50	1.73	0.77	100.00	3,916
			5.00	5.75	2.57		2,399
			8.50	9.78	4.37		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

PASQUILL STABILITY CATEGORY	TEMP Deg F	TEMP Deg C	WIND SPEED (knots)	WIND SPEED (mi/hr)	WIND SPEED (m/sec)	MIXING LAYER HEIGHT (meters)	NO DEATHS HAZARD DISTANCE (meters)
F	- -	- -	1.50	1.73	0.77	50.00	14,779
			5.00	5.75	2.57		5,931
			N/A	N/A	N/A		N/A
			N/A	N/A	N/A		
			N/A	N/A	N/A		
			N/A	N/A	N/A		

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Section E.2
Boundary Distance Worksheets

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DEPOT BOUNDARY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16 C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-AGC-041

AGENT: GB

AMOUNT: 101.4 lbs

MODE: SEM

DURATION: 15 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,931)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,040)	NW (4,648)	NNW (3,581)
0.77 / 4,509	x	x	x										x			x
2.57 / 2,544																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,931)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,040)	NW (4,648)	NNW (3,581)
0.77 / 11,963	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 / 4,883	x	x	x						x			x	x		x	x
4.37 / 3,470	x															

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,931)	S (4,329)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,040)	NW (4,648)	NNW (3,581)
0.77 / 20,000	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 / 20,000	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-BGC-042

AGENT: GB

AMOUNT: 22.0 lbs

MODE: SEM

DURATION: 12 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,048																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 3,580	x															
2.57 1,905																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 12,855	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 4,675	x	x	x						x			x	x		x	x

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-CGC-042

AGENT: GB
AMOUNT: 5.79 lbs
MODE: SEM
DURATION: 12 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
101	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.57																
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4.37																
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
1,667	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.57																
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4.37																
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
3,587	x	x	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	x
2.57																
1,743	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-KGC-042

AGENT: GB
AMOUNT: 35.24 lbs
MODE: SEM
DURATION: 12 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 / 2,621																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (5,531)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 / 4,808	X	X	X						X			X	X		X	X
2.57 / 2,536																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 / 20,000	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 / 7,856	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-F-2
METOROLOGICAL DISPERSION WORKSHEETS

AGENT: HD

ID NUMBER: PO-KHC-042

AMOUNT: 42.46 lbs

MODE: SEM

DURATION: 17 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 786	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.57	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4.37	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 1,321	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.57	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4.37	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,940	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.57	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-KVC-042

AGENT: VX
AMOUNT: 40.0 lbs
MODE: SEM
DURATION: 12 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 4,410	X	X	X													X
2.57 2,527																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 11,393	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 4,838	X	X	X						X			X	X		X	X
4.37 3,469	X															

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,99	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 > 20,000	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 > 20,000	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE 16-1-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-PGC-042	AGENT: GB		KEY:
	AMOUNT: 15.6 lbs		X - exceeds depot boundry
	MODE: SEM		5 - five to ten kilometers
	DURATION: 12 min		10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 1,704																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,933																
2.57																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3.581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 8,950	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
2.57 3,477	x															

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERS ON WORKSHEETS

ID NUMBER: PO-SVC-042

AGENT: VX
AMOUNT: 33.9 lbs
MODE: SEM
DURATION: 12 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,643)	NNW (3,581)
0.77 4,083	x	x	x													x
2.57 2,306																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 9,776	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
2.57 4,298	x	x	x													x
4.37 3,121																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 20,000	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 19,932	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

DEPOT BOUNDRY CHECK SHEET
TEAD CSOP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-KGF-045

AGENT: GB
AMOUNT: 50.4 lbs
MODE: SEM
DURATION: 106 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
2,530																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
4,934	X	X	X						X			X	X		X	X
2.57																
2,261																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
>20,000	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57																
6,906	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-CGC-049

AGENT: GB
AMOUNT: 01.6 lbs
MODE: INS
DURATION: 0 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 810																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 1,284																
2.57																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,499																
2.57																

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER FE-16-F-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-PGC-049

AGENT: GB
AMOUNT: 06.5 lbs
MODE: INS
DURATION: 0 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 1,632																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,739																
2.57																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 7,387	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
2.57 3,481	x															

DEPOT BOUNDRY CHECK SHEET
TEAD CSOP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-PVC-049

AGENT: VX
AMOUNT: 06.0 lbs
MODE: SEM
DURATION: 2 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 1,719																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,875																
2.57																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 8,238	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
2.57 3,730	x	x														x

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-QGC-049

AGENT: GB
AMOUNT: 14.5 lbs
MODE: INS
DURATION: 0 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,435																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 4,313	x	x	x													x
2.57 2,611																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 17,105	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 6,832	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-RGC-049

AGENT: GB
AMOUNT: 10.7 lbs
MODE: INS
DURATION: 0 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,092																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 3,607	x	x														x
2.57 2,201																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 12,452	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 5,081	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-F-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-RVC-049

AGENT: VX
AMOUNT: 10.0 lbs
MODE: SEM
DURATION: 2 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,219																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 3,813	X	X														X
2.57 2,336																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 14,052	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 5,678	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

DEPOT BOUNDRY CHECK SHEET
TEAD CSOP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-CGC-50

AGENT: GB
AMOUNT: 1.6 lbs
MODE: INS
DURATION: 0 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 810																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 1,286																
2.57																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,499																
2.57																

DEPOT BOUNDRY CHECK SHEET
TEAD CSOP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-PGC-050

AGENT: GB
AMOUNT: 06.5 lbs
MODE: INS
DURATION: 0 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 1,632																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,739																
2.57																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 7,387	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
2.57 3,481	x															

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOG.CAL DISPERSION WORKSHEETS

ID NUMBER: PO-PVC-050

AGENT: VX

AMOUNT: 06.0 lbs

MODE: SEM

DURATION: INS min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 1,719																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,567)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,875																
2.57																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 8,238	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
2.57 3,730	X	X														X

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-RGC-050

AGENT: GB
AMOUNT: 10.7 lbs
MODE: INS
DURATION: 0 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,931)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,092																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,931)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 3,607	x	x														x
2.57 2,201																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,931)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 12,452	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 5,081	5	5	5					5	5	5		5	5	5	5	5

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-RVC-050

AGENT: VX
AMOUNT: 10.0 lbs
MODE: SEM
DURATION: 2 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (·,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
2,219																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
3,813	x	x														x
2.57																
2,336																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
14,052	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57																
5,678	5	5	5	5	5			5	5	5		5	5	5	5	5

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE 16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-KGF-051

AGENT: GB
AMOUNT: 29.0 lbs
MODE: SEM
DURATION: 61 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
2,002																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
3,661	x	x														x
2.57																
1,757																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77																
16,310	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57																
4,281	x	x	x													x

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE 16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-KHF-051

AGENT: HD
AMOUNT: 18.0 lbs
MODE: SEM
DURATION: 69 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 481	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.57	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4.37	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 772	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.57	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4.37	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 1,610	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.57	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE 16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PQ-CGC-052

AGENT: GB

AMOUNT: 01.6 lbs

MODE: INS

DURATION: 0 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 810	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.57	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4.37	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 1,286	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.57	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4.37	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,499	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.57	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE 16 C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-VUC-052

AGENT: VX
AMOUNT: 10.5 lbs
MODE: SEM
DURATION: 2 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,274																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 3,916																
2.57 2,399																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 14,779	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 5,931	5	5	5	5	5			5	5	5	5	5	5	5	5	5

DEPOT BOUNDRY CHECK SHEET
TEAD CSDP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-RGC-052

AGENT: GB
AMOUNT: 10.7 lbs
MODE: INS
DURATION: 0 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 2,092																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 3,607	x	x														x
2.57 2,201																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 12,452	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 5,081	5	5	5					5	5	5		5	5	5	5	5

DEPOT BOUNDRY CHECK SHEET
TEAD CSOP FACILITY
BASIS: RMP DRAWING 226-90, SHEET REFERENCE NUMBER TE-16-C-2
METOROLOGICAL DISPERSION WORKSHEETS

ID NUMBER: PO-VUG-052

AGENT: VX
AMOUNT: 10.5 lbs
MODE: SEM
DURATION: 2 min

KEY:
X - exceeds depot boundry
5 - five to ten kilometers
10 - ten or more kilometers

STABILITY: D

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 / 2,274																
2.57																
4.37																

STABILITY: E

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 / 3,916	X	X														X
2.57 / 2,399																
4.37																

STABILITY: F

DIRECTION/DISTANCE (meters)

WND SPEED (M/SEC)	N (3,315)	NNE (3,581)	NE (4,001)	ENE (5,601)	E (5,296)	ESE (6,591)	SE (6,458)	SSE (4,991)	S (4,629)	SSW (5,029)	SW (5,810)	WSW (4,667)	W (4,458)	WNW (5,048)	NW (4,648)	NNW (3,581)
0.77 / 14,779	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.57 / 5,931	5	5	5	5	5			5	5	5	5	5	5	5	5	5

Section E.3
Meteorological Frequency Spreadsheet

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Table E-1: Frequency of Meteorological Conditions Which Permit No Deaths Off-Post Excursions

SCENARIO ID NUMBER	D STABILITY 24 HOUR	D STABILITY DAYTIME	D STABILITY NIGHTTIME	E STABILITY 24 HOUR	E STABILITY DAYTIME	E STABILITY NIGHTTIME	F STABILITY 24 HOUR	F STABILITY DAYTIME	F STABILITY NIGHTTIME	******** ANNUAL FREQUENCY ******** 24 HOUR	DAYTIME	LIMITED DAYTIME	NIGHTTIME
PO-AGC-041	0.0348	0.0189	0.0159	0.1490	0.0272	0.1218	0.1970	0.0149	0.1821	0.3808	0.0610	0.0189	0.3198
PO-BGC-042	0.0000	0.0000	0.0000	0.0090	0.0016	0.0074	0.1930	0.0146	0.1784	0.2020	0.0162	0.0000	0.1858
PO-CGC-042	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0254	0.0019	0.0235	0.0254	0.0019	0.0000	0.0235
PO-KGC-042	0.0000	0.0000	0.0000	0.0399	0.0073	0.0326	0.1970	0.0149	0.1821	0.2369	0.0221	0.0000	0.2148
PO-KVC-042	0.0329	0.0179	0.0150	0.1490	0.0272	0.1218	0.1970	0.0149	0.1821	0.3789	0.0600	0.0179	0.3189
PO-PGC-042	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1921	0.0145	0.1776	0.1921	0.0145	0.0000	0.1776
PO-SVC-042	0.0329	0.0179	0.0150	0.1453	0.0266	0.1187	0.1970	0.0149	0.1821	0.3752	0.0593	0.0179	0.3159
PO-KGF-045	0.0000	0.0000	0.0000	0.0399	0.0073	0.0326	0.1970	0.0149	0.1821	0.2369	0.0221	0.0000	0.2148
PO-PGC-049	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1921	0.0145	0.1776	0.1921	0.0145	0.0000	0.1776
PO-PVC-049	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1929	0.0145	0.1784	0.1929	0.0145	0.0000	0.1784
PO-QGC-049	0.0000	0.0000	0.0000	0.0262	0.0048	0.0214	0.1970	0.0149	0.1821	0.2232	0.0196	0.0000	0.2036
PO-RGC-049	0.0000	0.0000	0.0000	0.0243	0.0044	0.0199	0.1941	0.0146	0.1795	0.2184	0.0191	0.0000	0.1993
PO-RVC-049	0.0000	0.0000	0.0000	0.0243	0.0044	0.0199	0.1944	0.0147	0.1797	0.2187	0.0191	0.0000	0.1996
PO-PGC-050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1921	0.0145	0.1776	0.1921	0.0145	0.0000	0.1776
PO-PVC-050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1929	0.0145	0.1784	0.1929	0.0145	0.0000	0.1784
PO-RGC-050	0.0000	0.0000	0.0000	0.0243	0.0044	0.0199	0.1941	0.0146	0.1795	0.2184	0.0191	0.0000	0.1993
PO-RVC-050	0.0000	0.0000	0.0000	0.0243	0.0044	0.0199	0.1944	0.0147	0.1797	0.2187	0.0191	0.0000	0.1996
PO-KGF-051	0.0000	0.0000	0.0000	0.0243	0.0044	0.0199	0.1930	0.0146	0.1784	0.2173	0.0190	0.0000	0.1983
PO-MVC-052	0.0000	0.0000	0.0000	0.0243	0.0044	0.0199	0.1944	0.0147	0.1797	0.2187	0.0191	0.0000	0.1996
PO-RGC-052	0.0000	0.0000	0.0000	0.0243	0.0044	0.0199	0.1941	0.0146	0.1795	0.2184	0.0191	0.0000	0.1993
PO-RVC-052	0.0000	0.0000	0.0000	0.0243	0.0044	0.0199	0.1944	0.0147	0.1797	0.2187	0.0191	0.0000	0.1996

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